

NEW PROGRAM PROPOSAL

Name of Institution

University of South Carolina Aiken (USCA)

Name of Program (include concentrations, options, and tracks)

Applied Mathematics

Program Designation

- Associate's Degree Master's Degree
 Bachelor's Degree: 4 Year Specialist
 Bachelor's Degree: 5 Year Doctoral Degree: Research/Scholarship (e.g., Ph.D. and DMA)
 Doctoral Degree: Professional Practice (e.g., Ed.D., D.N.P., J.D., Pharm.D., and M.D.)

Does the program qualify for supplemental Palmetto Fellows and LIFE Scholarship awards?

- Yes
 No

Proposed Date of Implementation

Fall 2018

CIP Code

270301

Delivery Site(s)

University of South Carolina Aiken (USCA)

Delivery Mode

- Traditional/face-to-face*
*select if less than 50% online
- Distance Education
 100% online
 Blended (more than 50% online)
 Other distance education

Program Contact Information (name, title, telephone number, and email address)

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Institutional Approvals and Dates of Approval

Department of Mathematical Sciences – September 18, 2017
College Council – September 22, 2017
Cabinet – September 25, 2017
University Planning Committee – October 3, 2017
Faculty Assembly – October 24, 2017
Chancellor – November 1, 2017

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President –
Board of Trustees -

Background Information

State the nature and purpose of the proposed program, including target audience and centrality to institutional mission. (1500 characters)

Currently the Department of Mathematical Sciences at USC Aiken offers a Bachelor of Science Degree in Math/Computer Science and a Bachelor of Science Degree in Industrial Mathematics. Discussions with local business and industries indicate that these two degrees no longer meet the needs of the area. As a result, USC Aiken proposes to sunset the current degrees as soon as current majors graduate (projected May 2021). Working with local business and industry, the Department of Mathematical Sciences proposes a new program in Applied Mathematics to help fill the regional, state, and national need for professionals who can use mathematics to solve problems within a variety of industries. This reworking of our current degrees in Industrial Mathematics and in Mathematics/Computer Science will enable USC Aiken students to focus on applied aspects of mathematics while learning the necessary fundamentals. A high quality liberal arts foundation will be maintained, and students will have the opportunity to pursue individual interests in business, computer science, or engineering to augment their degree.

USC Aiken intends for all graduates to be ready to succeed in a “dynamic global environment,” and today’s mathematics professionals must be committed to continual learning and to adapting to new challenges. This shift in degree focus—from theoretical to applied—will enable our graduates to contribute meaningfully and ethically in a variety of technically demanding fields.

List the program objectives. (2000 characters)

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In the context of a liberal arts education, the Applied Mathematics degree will provide students with:

- [1] knowledge and technical skills in fundamental and applied mathematics;
- [2] experience applying mathematical knowledge and skills to analyzing and solving problems;
- [3] experience in communicating solutions to problems in applied mathematics;
- [4] training in practice as applied mathematics professionals.

Success in this program will be shown through (a) attracting students into the degree, (b) reaching graduation numbers of 10 per year, (c) students mid-program obtaining internships in the field, (d) graduates of the program obtaining employment in the profession, especially in the region and state of SC

Assessment of Need

Provide an assessment of the need for the program for the institution, the state, the region, and beyond, if applicable. (1500 characters)

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The Bureau of Labor Statistics projects 73,000 job openings in mathematical science occupations from 2014-2024, with a projected growth rate nearly five times that of all occupations (April 2016). Openings for operation research analysts and statisticians are expected to number over 59,000 during the same time frame.

Aiken is home to a number of industries which rely on sophisticated mathematical thinking, and also sits within the larger Central Savannah River Area (CSRA) and the developing Fort Gordon Cyber District which has US Cyber Command at the hub. Major industry growth and an aging workforce raises concerns for the future health of many of these industries. We have worked closely with professionals in applied mathematics to design these degrees to help address the growing needs in our state and region.

Some relevant businesses in the area include Savannah River National Laboratory, Savannah River Nuclear Solutions, Savannah River Remediation, Tognum America Inc., BAE Systems, South Carolina Gas and Electric; Kimberly-Clark's Consumer Health Services; Bridgestone Passenger and Truck Tire Facility; AGY Materials Corporation; Shaw Industries; Washington Safety Management Solutions Corporation; Hubbell Power Systems; and Harvey Ignition Systems Engineering Corporation. Collectively these industries employ over 16,000 individuals.

Employment Opportunities

Is specific employment/workforce data available to support the proposed program?

Yes

No

If yes, complete the table and the component that follows the table on page 4. If no, complete the single narrative response component on page 5 beginning with "Provide supporting evidence."

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Employment Opportunities			
Occupation	Expected Number of Jobs	Employment Projection	Data Source
Operation research analysts	124 new jobs in SC	41% increase (2017-2027)	Talent Pipeline SC State Staffing Pattern
Statisticians	35 new jobs in SC	37% increase (2017-2027)	Talent Pipeline SC State Staffing Pattern
Actuary	15 new jobs in SC	47% increase (2017-2027)	Talent Pipeline SC State Staffing Pattern
Analytics	427 available September 2017		scworks.org
Operation research/data analysts	81 available September 2017		scworks.org
Statistician/statistical analyst	375 available September 2017		scworks.org
Actuary	4 available September 2017		scworks.org

Provide additional information regarding anticipated employment opportunities for graduates. (1000 characters)

As of September 2017, there were over 850 job postings in South Carolina in applied mathematics occupations according to SCWorks.org. In discussions with applied mathematics professionals in local industries, the consensus opinion on career outlook and continued job opportunities in this field was very positive. A recurring theme among our partners was the need to train the next generation of professionals not only for the increased demand in the job market, but also to replace those who are approaching retirement age. In all, there is no evidence that there will be difficulties for graduates of this program to find gainful employment in their field.

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Provide supporting evidence of anticipated employment opportunities for graduates, including a statement that clearly articulates what the program prepares graduates to do, any documented citations that suggests a correlation between this program and future employment, and other relevant information. Please cite specific resources, as appropriate. (3000 characters)

Note: Only complete this if the Employment Opportunities table and the section that follows the table on page 4 have not previously been completed.

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Will the proposed program impact any existing degree programs and services at the institution (e.g., course offerings or enrollment)?

Yes

No

If yes, explain. (500 characters)

USC Aiken currently offers an Industrial Mathematics degree, which will be phased out, and a degree in Mathematics/Computer Science will be replaced with a degree in Applied Computer Science. Additionally, some theoretical mathematics courses will be replaced with applied courses, or taught on an every-other-year basis.

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List of Similar Programs in South Carolina

Program Name	Institution	Similarities	Differences
Applied Math	Coastal Carolina University	The two programs have similar foundation courses in applied mathematics.	USCA focused more on modeling and application in industry. CCU offers minors in actuarial science, mathematics, and statistics.
Applied Mathematics	Presbyterian College	The two programs have similar core mathematics classes.	Stronger applied mathematics component at USCA(21 hours vs. 15 hours). USCA focused more on computing, modelling and application in industry.
Applied Mathematics, General	Charleston Southern University	The two programs have similar core mathematics classes.	CSU has more engineering courses and less applied mathematics courses required in the curriculum. USCA has a standard applied mathematics curriculum.
Applied Statistics	USC Columbia	The two programs have similar core mathematics classes.	USC offers a statistics program which deals with statistical method and applications. USCA offers an applied mathematics program which focus on application of mathematics in industry.

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Description of the Program

Projected Enrollment						
Year	Fall		Spring		Summer	
	Headcount*	Student Credit Hours**	Headcount	Credit Hours	Headcount	Credit Hours
AY18-19	20	80	20	180		
AY19-20	30	210	30	240		
AY20-21	35	268	35	326		
AY21-22	40	290	40	340		
AY22-23	40	290	40	340		

*Conservatively, we anticipate adding 10 new students each year into the program through year four. Then we anticipate graduating and adding 10 students each year thereafter, thus a total of 40 students in the program at max. We anticipate 10 students from the current program to change to the new program. Of those 10 students from the current program that change to the proposed program, we anticipate 5 graduating in 19/20 and 5 graduating in 20/21. Therefore in year 1 we have 10 new students and 10 change of program students for a total of 20 students in year 1. In year 2 there are 10 additional new students added to the 20 students from year one, for a total of 30 students.

**Student Credit Hours is calculated based solely on math credit hours. The student credit hours is calculated by the number of Applied Mathematics Course credit hours taken multiplied by the number of students. (example, 1st semester freshman, take 4 hours of applied math, therefore 20 students x 4 credit hours = 80. In the spring semester of the freshman year they take 9 credit hours, therefore 20 students x 9 credit hours = 180. For subsequent years, the calculation is based on how many year one students taking year 1 classes and how many year 2 students taking year 2 classes, etc.)

Besides the general institutional admission requirements, are there any separate or additional admission requirements for the proposed program?

- Yes
 No

If yes, explain. (1000 characters)

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Are there any special articulation agreements for the proposed program?

Yes

No

If yes, identify. (1000 characters)

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Curriculum

Select one of the following charts to complete: Curriculum by Year **or** Curriculum by Category

Curriculum by Year					
Course Name	Credit Hours	Course Name	Credit Hours	Course Name	Credit Hours
Year 1					
Fall		Spring		Summer	
Calculus I	4	Applied Math Seminar	1		
Natural Science	4	Calculus II	4		
HIST 101 or 102	3	Intro to Algo Design 1	4		
ENGL 101	3	Natural Science	4		
Critical Inquiry	1	ENGL 102	3		
Total Semester Hours	15	Total Semester Hours	16	Total Semester Hours	
Year 2					
Fall		Spring		Summer	
Calculus III	4	Ordinary Differential Equations	4		
Mathematical Software	3	Advanced Mathematical Programming	3		
Discrete Math	3	Humanities	3		
Foreign Language	4	COMM 201 or 241	3		
		Foreign Language	4		
Total Semester Hours	14	Total Semester Hours	17	Total Semester Hours	
Year 3					
Fall		Spring		Summer	
Statistics	3	Statistical Quality Assurance	3		
Elementary Linear Algebra	3	Industrial Mathematics I	3		
Technical Elective	3	Numerical Methods	3		
Social Behavior Science	3	Technical Elective	3		
Macro/Micro-economics	3	Business Finance	3		
Total Semester Hours	15	Total Semester Hours	15	Total Semester Hours	
Year 4					
Fall		Spring		Summer	
Applied Math Capstone I	3	Applied Math Capstone II	3		
Industrial Mathematics II	3	Technical Elective	3		
Humanities	3	Humanities	3		
POLI 201, HIST 201, 202	3	Social Behavior Science	3		
Free Elective	3	Free Elective	1		
Total Semester Hours	15	Total Semester Hours	13	Total Semester Hours	

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Course Descriptions for New Courses

Course Name	Description
MATH 135: Applied Math Seminar	A brief (1 credit hour) introduction, using case studies, to show how applied mathematics is used in government and industry.
MATH 225: Mathematical Software	Introduction to the use of mathematical software packages (e.g., Matlab, Maple) and other computer algebra systems in applied mathematics, engineering, and statistics.
MATH 325: Advanced Mathematical Programming	This course emphasizes the use of mathematical software packages to implement and solve complex (linear, discrete, and continuous) mathematical models. Assessment of the validity of these models using real-world data will also be discussed.
MATH 591: Capstone II	Continuation of MATH 590. In-depth study or research project.

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Faculty and Administrative Personnel				
Rank	Full- or Part-time	Courses Taught or To be Taught, Including Term, Course Number & Title, Credit Hours	Academic Degrees and Coursework Relevant to Courses Taught, Including Institution and Major	Other Qualifications and Comments (i.e., explain role and/or changes in assignment)
1: Assistant Professor of Applied Mathematics	Full-time	MATH 135 (1) MATH 518 (3) MATH 519 (3) MATH 590 (3) MATH 591 (3) STAT 509 (3) STAT 510 (3)	PhD Operations Research University of North Carolina MS Operations Research Air Force Institute of Technology	
2: Associate Professor of Applied Mathematics and Computer Science	Full Time	MATH 141 (4) MATH 142 (4) MATH 225 (3) MATH 325 (3) CSCI 145 (4) CSCI 562 (3)	PhD in Applied Mathematics MS in Computer Science University of Rochester	
3: Professor of Mathematics	Full Time	MATH 141 (4) MATH 142 (4) MATH 241 (4) MATH 242 (4) MATH 544 (3)	PhD in Mathematics MS in Mathematics MS in Industrial and Operations Engineering University of Michigan	

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4: Professor of Computer Science	Full-time	CSCI 145 (4)	PhD in Computer Science Illinois Institutes of Technology(IIT) MS in Computer Science Western Michigan University	
5: Professor of Mathematics and Computer Science	Full Time	MATH 141 (4) MATH 142 (4) MATH 241 (4) MATH 242 (4) CSCI 145 (4)	PhD in Mathematics MS in Computer Science, The University of Western Ontario, Canada	
6: Professor of Mathematics	Full Time	MATH 135 (1) MATH 141 (4) MATH 142 (4) MATH 241 (4) MATH 242 (4) MATH 325 (3) MATH 519 (3) MATH 544 (3) MATH 590 (3) MATH 591 (3)	PhD in Mathematics University of South Carolina MS in Applied Mathematics University of Bordeaux, France	
7: Professor of Mathematics	Full-time	MATH 141 (4) MATH 142 (4) MATH 225 (3) MATH 241 (4) MATH 242 (4)	PhD in Mathematics University of South Carolina MSc in Pure Mathematics University of Newcastle-upon-Tyne	

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8: Professor of Mathematics and Computer Science	Full Time	MATH 174 (3)	PhD in Mathematical Sciences (Graph Theory) MS in Mathematical Sciences (Computer Science) The University of Memphis	
9: Professor of Mathematics and Computer Science	Full Time	MATH 141 (4) MATH 142 (4) MATH 241 (4) MATH 242 (4) MATH 174 (3) MATH 225 (3) CSCI 145 (4)	PhD in Mathematics MS in Computer Science, The University of Western Ontario, Canada	

Note: Individuals should be listed with program supervisor positions listed first. Identify any new faculty with an asterisk next to their rank.

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Total FTE needed to support the proposed program (i.e., the total FTE devoted just to the new program for all faculty, staff, and program administrators):

Faculty

Staff

Administration

Faculty /Administrative Personnel Changes

Provide a brief explanation of any additional institutional changes in faculty and/or administrative assignment that may result from implementing the proposed program. (1000 characters)

A majority of the faculty are currently teaching MATH and CSCI courses within the department. Distribution of courses will be altered as the new degree comes on line and the existing degree is phased out. No new faculty in Applied Mathematics are necessary.

Library and Learning Resources

Identify current library/learning collections, resources, and services necessary to support the proposed program and any additional library resources needed. (1000 characters)

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Through the Gregg-Graniteville Library, the B.S. students in Applied Mathematics will have access to: over 130,000 print volumes, over 4,000 media materials, 232 electronic databases (most with full text), over 100,000 e-journals, and approximately 350,000 e-books as well as more than 14,000 print government documents and electronic access to many additional titles. The library provides access to an adequate number of science and math databases for the proposed program. 894 full-text mathematics journal are available in library databases. Monograph holdings in mathematics total approximately 4,122 print titles and 6,834 electronic titles. The current monograph and journal collection is adequate to meet the needs of the proposed degree program with no additional library funds required.

Student Support Services

Identify academic support services needed for the proposed program and any additional estimated costs associated with these services. (500 characters)

No additional academic support services are expected for this program.

Physical Resources

Identify any new instructional equipment needed for the proposed program. (500 characters)

Increased high performance computing needs will be handled through USC Research Cyberinfrastructure program.

Will any extraordinary physical facilities be needed to support the proposed program?

Yes

No

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Identify the physical facilities needed to support the program and the institution's plan for meeting the requirements, including new facilities or modifications to existing facilities. (1000 characters)

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Financial Support

Estimated New Costs by Year						
Category	1st	2nd	3rd	4th	5th	Total
Program Administration						
Faculty and Staff Salaries	10000	10000	10000	10000	10000	50000
Graduate Assistants						
Equipment						
Facilities						
Supplies and Materials						
Library Resources						
Other*						
Total	10000	10000	10000	10000	10000	50000
Sources of Financing						
Category	1st	2nd	3rd	4th	5th	Total
Tuition Funding	207360	317261	377540	440104	448906	1791172
Program-Specific Fees	600	900	1050	1200	1200	4950
State Funding (i.e., Special State Appropriation)*						
Reallocation of Existing Funds*						
Federal Funding*						
Other Funding*						
Total	207960	318161	378590	441304	450106	1796122
Net Total (i.e., Sources of Financing Minus Estimated New Costs)	197960	308161	368590	431304	440106	1746122

*Provide an explanation for these costs and sources of financing in the budget justification.

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Budget Justification

Provide a brief explanation for the other new costs and any special sources of financing (state funding, reallocation of existing funds, federal funding, or other funding) identified in the Financial Support table. (1000 characters)

Note: Institutions need to complete this budget justification *only* if any other new costs, state funding, reallocation of existing funds, federal funding, or other funding are included in the Financial Support table.

Current faculty and resources that support the current degrees in Math/Computer Science and Industrial Mathematics will be used to support the proposed Applied Mathematics degree. New expenses are for use of adjunct faculty.

Although we have included tuition as a “new” source of revenue for the short term, once the “old” math/computer degree and industrial math degrees sunset, we anticipate the total number of students in that program to approximately equal the current number of students in the program, thus no new net gain. Most net gain will be in the proposed new Applied Computer Science program.

Tuition in the table is calculated by multiplying the number of students in the program by the full-time student tuition rate per semester. In year one the full-time tuition is \$5,184. For subsequent years we anticipate tuition to increase by 2% each year. Therefore for years 2-5 the full-time tuition rate/semester used in the calculations are \$5,288 (year 2), \$5,393 (year 3), \$5,501 (year 4) and \$5,611 (year 5). Therefore tuition generated in year 1 = 20 students X \$5,184 X 2 semesters = \$207,360.

Students in this major are assessed a \$15/semester fee.

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Evaluation and Assessment

Programmatic Assessment: Provide an outline of how the proposed program will be evaluated, including any plans to track employment. Identify assessment tools or software used in the evaluation. Explain how assessment data will be used. (3000 characters)

The department's assessment plan and results for program objectives and student learning outcomes are currently reviewed on a three-year rotation by USC Aiken's Academic Assessment Committee. This practice will continue as we shift between degree programs. Additionally, our assessment data is reviewed annually by the unit head. Annual oversight of the department's assessment results is carried out by the Dean of the College of Sciences and Engineering and by the university's Executive Vice Chancellor for Academic Affairs.

TracDat has been the repository for assessment reports, though the university is migrating to TaskStream. Relevant data and reports for this new degree program will be uploaded to and available from TaskStream. Continuous improvement to both courses and program will be pursued in response to assessment findings.

Internships for students and employment of graduates will be tracked through the cooperative efforts of the department, Office of Career Services, and the Alumni Office.

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Student Learning Assessment

Expected Student Learning Outcomes	Methods of/Criteria for Assessment
SLO1: Demonstrate knowledge in the core of mathematics, statistics, and numerical methods.	Embedded questions in MATH 141 (Calculus I), MATH 142 (Calculus II), STAT 509 (Statistics), CSCI 562 (Numerical Methods). Senior Exit Survey
SLO2: Demonstrate effective use of mathematical, statistical, and computational tools.	Final project/assignment in MATH 519 (Industrial Mathematics I) and STAT 510 (Statistical Quality Control) Senior Exit Survey
SLO3: Demonstrate proficiency in representing mathematical relationships and solving complex problems with logic reasoning.	Final projects in MATH 518/519 (Industrial Mathematics I/II) Senior Exit Survey
SLO4: Demonstrate problem solving skills in real-life applied mathematics settings and be able to communicate solutions.	Oral presentation of capstone project in MATH 590 or 591 (Capstone Seminar) Senior Exit Survey
SLO5: Demonstrate proficiency in working in interdisciplinary environments.	Team peer review and mentor review of MATH 590/591 capstone project Senior Exit Survey

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Will the proposed program seek program-specific accreditation?

Yes

No

If yes, provide the institution's plans to seek accreditation, including the expected timeline for accreditation. (500 characters)

Will the proposed program lead to licensure or certification?

Yes

No

If yes, explain how the program will prepare students for licensure or certification. (500 characters)

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Teacher or School Professional Preparation Programs

Is the proposed program a teacher or school professional preparation program?

Yes

No

If yes, complete the following components.

Area of Certification

USC Aiken offers a degree in Secondary Education-Mathematics. Care is being taken to ensure that the Mathematical Science department will continue to offer courses necessary to that degree, though some mutually agreeable changes are likely.

Please attach a document addressing the South Carolina Department of Education Requirements and SPA or Other National Specialized and/or Professional Association Standards.