

PROGRAM MODIFICATION PROPOSAL FORM

Name of Institution: **University of South Carolina Aiken**

Briefly state the nature of the proposed modification (e.g., adding a new concentration, extending the program to a new site, curriculum change, etc.):

Addition of a new concentration in DATA SCIENCE to the existing BS Applied Computer Science

Current Name of Program (include degree designation and all concentrations, options, and tracks):

BS Applied Computer Science with concentrations in (a) general, (b) cybersecurity, (c) applied gaming (which is being renamed to "gaming and simulation")

Proposed Name of Program (include degree designation and all concentrations, options, and tracks):

BS Applied Computer Science with concentrations in (a) general, (b) cybersecurity, (c) applied gaming Game and Simulation (d) data science.

Program Designation:

- | | |
|---|--|
| ☐ Associate 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 currently qualify for supplemental Palmetto Fellows and LIFE Scholarship awards?

- ☒ Yes
☐ No

If No, should the program be considered for supplemental Palmetto Fellows and LIFE Scholarship awards?

- ☐ Yes
☐ No

Proposed Date of Implementation: **Fall 2024**

CIP Code: **11.0101**

Current delivery site(s) and modes: USC Aiken, Aiken SC; traditional/face-to-face

Proposed delivery site(s) and modes: USC Aiken, Aiken SC; traditional/face-to-face

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

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Institutional Approvals and Dates of Approval:

Department	09/14/2022
College Council	10/04/2022
Faculty Assembly	2/27/2023
Chancellor USCA	5/2/2023
BOT	6/23/2023

REACH Act Compliance: All USC Aiken students are required to take HIST 201, HIST 202 or POLI 201 to earn a degree. All courses' syllabi demonstrate compliance with the REACH Act and have been approved.

Background Information

Provide a detailed description of the proposed modification, including target audience, centrality to institutional mission, and relation to strategic plan.

USCA has been growing in the areas of computer science and especially in cyber for the past several years. USCA has been designated an NSA Center of Academic Excellence Cyber Defense NSA CAE-CD. This has been a result of USCA's mission to support the region's industry and assets. In this case, the western region of the state of SC has significant DOD and DOE assets. In addition, the new SC National Guard Readiness Center and Cyber Center will be located on USC Aiken's campus and in anticipation of that USCA has created a Security Operations Center (SOC) with the capability to expand. Along with these initiatives a rapidly growing undergraduate program provides the underpinnings for USCA to provide a substantial concentration in Data Science to help prepare highly needed Data Analysis workforce professionals. Our target audience will be both first-time college students and transfer students. Data science topics such analytics and big data are some of the fast growing and most important fields in higher education. (Colleges Incorporate Data Science into Curriculums, <https://www.computerworld.com/article/2718644/colleges-incorporate-data-science-into-curriculums.html> accessed 8/31/2023). Big Data Analytics in Higher Education: A Review: International Journal of Engineering and Science, V6, pp.14-21, 2017. For this reason, this area should provide majors on its own accord. We do have all the data science courses as electives for other concentrations and in our data science certificate.

Assessment of Need

Provide an assessment of the need for the program modification for the institution, the state, the region, and beyond, if applicable.

In the current Internet era, a huge amount of raw data from many fields is accumulated at a time. The advancement of hardware and development of algorithms and tools in Data Science enable people to acquire and analyze the raw data, yield information, and provide knowledge and insight on the data as well make data-driven decisions. In the current job market, there is a great demand for professionals who understand the algorithms in Data Science and use the tools in Data Science to solve real world problems. Data Science is widely used in various industry domains, including marketing, healthcare, finance, banking, policy work, and more. It is imperative that USCA educate and train students to become professionals who are very competitive in the Data Science job market. To that end, we propose adding a Data Science concentration to the BS Applied Computer Science degree program. Students in this concentration will learn all the aspects of Data Science (data collection, modeling, machine learning, data mining, and inference) as well as the foundational principles of computer science (data structures, algorithms, and databases).

Supporting Evidence of Anticipated Employment Opportunities

Employment Opportunities

Occupation	State		National		Data Type and Source
	Expected Number of Jobs	Employment Projection	Expected Number of Jobs	Employment Projection	
Data Scientists	1180	6.6% RSE	112,200	+36% much faster than average	https://www.bls.gov/ooh/math/data-scientists.htm https://www.bls.gov/oes/current/oes_sc.htm

Transfer and Articulation

Identify any special articulation agreements for the modified proposed program. Provide the articulation agreement or Memorandum of Agreement/Understanding.

We have set up MOUs for the cyber program AS to BS and we are setting up BAAS programs in IT to complete AS to BAAS programs in IT with community and technical colleges. Due to the curriculum of data science, it would be unlikely to be a viable transfer program. However, we do hope to provide certificate augmentation and prepare students for industry and advanced degrees in programs that require significant data science and analytics skills.

Description of the Program

Year	Fall Headcount		Spring Headcount	
	New	Total	New	Total
1	8	8	7	7

2	10	17	9	15
3	10	23	9	20
4	12	32	11	28

Explain how the enrollment projections were calculated.

We have approached this estimate very conservatively. We currently have 254 B.S. applied computer science majors and are growing rapidly. Minimally, we will have 300 by 2024. Incoming cohorts are estimated conservatively at 8 in year 1, 10 in years 2 and 3, and 12 in years 4 and following. Attrition of 2-3 students out of each cohort is expected.

Curriculum

Attach a curriculum sheet identifying the courses required for the program.

Curriculum Changes

Courses Eliminated from Program	Courses Added to Program	Core Courses Modified
0	4	0

New courses are shown in italics in the following table. One new course in each of the fall and spring semesters of years 2 and 3 of the curriculum.

Course Name	Credit Hours	Course Name	Credit Hours
Fall		Spring	
MATH A141 Calculus I	4	MATH A142 Calculus II	4
CSCI A125 Introduction to Computer Science	3	ENGL A102 Rhetoric & Composition	3
ENGL A101 Critical Reading & Comp.	3	CSCI A145 Algorithmic Design I	4
GEN ED HIST 101 or 102	3	STAT A509 Statistics	3
MATH 174 Discrete Math	3	GEN ED Soc./Behavioral Science	3
Total Semester Hours	16	Total Semester Hours	17
Fall		Spring	
CSCI A146 Algorithmic Design II	4	CSCI A220 Data Structures & Algorithms	3
MATH A344 Linear Algebra for CS & Eng.	3	CSCI A185 Computer Applications & Prog.	3
<i>CSCI A165 Data Science with Python</i>	4	CSCI A360 Software Engineering	3
GEN ED Foreign Language	4	GEN ED Soc./Behavioral Sciences	3
		<i>CSCI A345 Data Mining & Machine Learning</i>	3
Total Semester Hours	15	Total Semester Hours	15
Fall		Spring	
<i>CSCI A 385 Advanced Machine Learning</i>	3	<i>CSCI A400 Special Topics in Data Science</i>	3
GEN ED COMM 201/241	3	CSCI A320 Object-Oriented Programming	3

Course Name	Credit Hours	Course Name	Credit Hours
GEN ED Humanities	3	CSCI A415 Computer Network	3
CSCI A255 Intro. to Information Security	3	GEN ED Humanities	3
GEN ED Foreign Language	3	GEN ED POLI 201, HIST 201/202	3
Total Semester Hours	15	Total Semester Hours	15
Fall		Spring	
CSCI A520 Database System Design	3	CSCI A592 Capstone Seminar II	3
CSCI A591 Capstone Seminar I	3	ELECTIVE CSCI Technical Elective	3
ELECTIVE CSCI Technical Elective	3	GEN ED Natural Science	4
GEN ED Natural Science	4	GEN ED Humanities	3
Total Semester Hours	13	Total Semester Hours	13
Total Hours			120

New Courses

List and provide course descriptions for new courses.

All of the new courses for the concentration have been approved by all curriculum committees, provost, chancellor and BOT.

CSCI A165 Data Science with Python (4) (Prereq: CSCI A125 with a grade of C or better) This course introduces the basics of Data Science. It also includes additional topics such as inheritance and polymorphism, files, and exception handling. It introduces standard Python libraries for Data Science.

CSCI A345 Data Mining and Machine Learning (3) (Prereq: CSCI A165, MATH A344, CSCI A220, and STAT A509 with a grade of C or better) This course includes the basic concepts in data mining and machine learning, algorithms on classification, clustering, regression, and the implementations of those algorithms.

CSCI A385 Advanced Machine Learning (3) (Prereq: CSCI A345 with a grade of C or better) This course provides instruction on machine learning algorithms on dimensionality-reduction and the implementations of those machine learning algorithms. The neural networks and convolution neural networks are also introduced.

CSCI A400 Special Topics in Data Science (3) (Prereq: DATA A345 with a grade of C or better) The instructor selects some special topics in Data Science. The students learn special topics from regular teaching and their independent studies under the guidance of the instructor.

Similar Programs in South Carolina offered by Public and Independent Institutions

Identify similar programs offered and describe the similarities and differences for each program. csci 207, 210,327,101,401, 208,271,355, dsci 401,402,101, 201

Program Name and Designation	Total Credit Hours	Institution	Similarities	Differences
B.S. in Data Science	120	College of Charleston	4 similar courses in Data Science	The College of Charleston program includes 65 credit hours Specializations in business analytics, social sciences, bioinformatics, and arts and humanities.
B.A. in Data Science	120	Winthrop University	The general IT courses are similar along with standard data science courses of intro to data science, data mining, .	Winthrop has a standalone BA data science program. Ours is a BS in Computer Science with concentration in data science.

Faculty

State whether new faculty, staff or administrative personnel are needed to implement the program modification; if so, discuss the plan and timeline for hiring the personnel. Provide a brief explanation of any personnel reassignment as a result of the proposed program modification.

One new tenure-track faculty position with expertise in data science will be hired to start in year 1 (Fall 2024).

Resources

Identify new library, instructional equipment and facilities needed to support the modified program.

Library Resources: Additional resources are not required above what is already supported with our current programs.

Through the Gregg-Graniteville Library, the B.S. students in Computer Science with concentrations in Cybersecurity or Applied Gaming 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. 799 full-text computer science journal and 894 full-text mathematics journals are available in library databases. Monograph holdings in computer science total approximately 260 print titles and 5,718 electronic titles. The computer science holdings are strongest in programming language and applications.

Equipment: Additional resources are not required above what is already supported with our current programs.

Facilities: Additional resources are not required above what is already supported with our current programs.

Impact on Existing Programs

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

☐ Yes

☒ No

Financial Support

Sources of Financing for the Program by Year												
Category	1 st		2 nd		3 rd		4 th		5 th		Grand Total	
	New	Total	New	Total	New	Total	New	Total	New	Total	New	Total
Tuition Funding	77,985	77,985	166,368	166,368	223,557	223,557	311,940	311,940	353,532	353,532	1,133,382	1,133,382
Program-Specific Fees	225	225	480	480	645	645	900	900	1,020	1,020	3,270	3,270
Special State Appropriation	-	-	-	-	-	-	-	-	-	-	-	-
Reallocation of Existing Funds	-	-	-	-	-	-	-	-	-	-	-	-
Federal, Grant, or Other Funding	-	-	-	-	-	-	-	-	-	-	-	-
Total	78,210	78,210	166,848	166,848	224,202	224,202	312,840	312,840	354,552	354,552	1,136,652	1,136,652
Estimated Costs Associated with Implementing the Program by Year												
Category	1 st		2 nd		3 rd		4 th		5 th		Grand Total	
	New	Total	New	Total	New	Total	New	Total	New	Total	New	Total
Program Administration and Faculty/Staff Salaries	127,800	127,800	127,800	127,800	127,800	127,800	127,800	127,800	127,800	127,800	639,000	639,000
Facilities, Equipment, Supplies, and Materials	-	-	-	-	-	-	-	-	-	-	-	-

Library Resources	-	-	-	-	-	-	-	-	-	-	-	-
Other (specify)	-	-	-	-	-	-	-	-	-	-	-	-
Total	127,800	127,800	127,800	127,800	127,800	127,800	127,800	127,800	127,800	127,800	639,000	639,000
Net Total	(49,590)	(49,590)	39,048	39,048	96,402	96,402	185,040	185,040	226,752	226,752	497,652	497,652

Budget Justification

Provide a brief explanation for all new costs and sources of financing identified in the Financial Support table.

Assuming 100% in-state tuition rate for students of \$433.25 and an average of 12 hours/semester per student (there are likely to be some at the higher out-of-state rate). $\$433.25 \times \text{Student Semester Enrollments} \times 12 \text{ hours} = \text{annual tuition revenue}$.

The Department of Computer Science, Engineering, and Mathematics is already offering all the needed courses for students in Data Science except the four new courses. For these courses we are hiring a new full time assistant professor in computer science/Data science starting Year 1 (Fall 2024). The only projected cost for now is the salary of the new professor which is around \$90,000 plus 42% FB total or \$127,800/yr. This will be covered by the tuition of the new students joining this program. This new faculty line will also provide support for growth in related degrees.

Evaluation and Assessment

Program Objectives	Student Learning Outcomes Aligned to Program Objectives	Methods of Assessment
Knowledge of programming fundamentals: Graduates of the program should have a solid foundation in programming concepts such as data structures, algorithms, and software development principles	SLO1: Students should be able to write code, design software solutions, and apply best practices in software development.	Embedded questions in (CSCI A145 Algorithmic Design I & CSCI A146 Algorithmic Design II) Exit Survey
Data analysis and statistics: Students should gain expertise in statistical methods and data analysis techniques used in various data-driven fields, including data mining, data visualization, machine learning, and predictive modeling.	SLO2: Students should be able to apply statistical and data analysis techniques to diverse datasets and interpret the results.	Embedded questions in STAT A509 Statistics Exit Survey
Data storage and management: Students should be able to design, implement and manage complex data systems, databases, and data warehouses.	SLO3: Students should be able to design, implement and manage complex data systems, databases, and data warehouses.	Embedded questions in (CSCI A520 & CSCI A385 Advanced Machine Learning
Domain-specific knowledge: Students should develop expertise in the application of computer science and data	SLO4: Students should be able to apply their knowledge of computer science and data analysis techniques in specific	Independent project/laboratory assignment and Embedded questions in (CSCI A345 Data Mining and Machine Learning)

analysis in specific domains such as business, health care, finance, engineering, or environmental science.	domains and solve complex problems related to those domains.	Exit Survey
Problem-solving and critical thinking: Graduates should be able to use analytical and critical thinking skills to solve complex problems in real-world scenarios.	SLO5: Students should be able to apply analytical and critical thinking skills to solve complex problems related to data analysis and software development.	Independent project/laboratory assignment in (CSCI A165 Data Science with Python, & CSCI A400 Special Topics in Data Science) Exit Survey
Communication and teamwork: Graduates should be able to communicate technical concepts and collaborate effectively in interdisciplinary teams with other data scientists, software developers, and stakeholders.	SLO6: Students should be able to communicate technical concepts effectively to stakeholders, work collaboratively in interdisciplinary teams and provide feedback to peers.	Capstone Projects in CSCI A591 Capstone Seminar I & CSCI A592 Capstone Seminar II): Capstone projects may be used to assess a student's ability to apply their learning to a significant project, such as developing a software application, conducting a research project, or developing a data system. Exit Survey

To track the employment of graduates of our Bachelor of Science in Applied Computer Science with Data Science Concentration, there are several plans that can be implemented:

1. **Alumni Surveys:** Conducting alumni surveys is a common method to track the employment of graduates. These surveys can gather information on employment status, job title, industry, job location, salary, and other relevant data.
2. **Employer Partnerships:** Building partnerships with employers in industries related to computer science and data science can provide insights into job openings, hiring trends, and skill requirements, as well as create networking opportunities for students.
3. **Internship and Co-op Programs:** Offering internships and co-op programs can provide students with hands-on experience and networking opportunities with potential employers. These programs can also help students build their resume and gain practical experience, which can increase their chances of finding employment after graduation.
4. **Career Services:** Providing career services to students, such as job fairs, resume workshops, and interview preparation, can help them prepare for their job search and increase their chances of finding employment after graduation.
5. **Data Analytics:** Tracking and analyzing data on graduate employment outcomes, such as employment rates, salary ranges, and industry placement, can help identify trends and areas for program improvement.

We have an extensive assessment plan that requires assessment of all degree SLOs and KPIs annually and then each degree is reviewed every three years by the University Academic Assessment Committee. Annually, faculty will assess student achievement of learning outcomes which will be included in the academic program's annual report. Triennially, the Academic Assessment Committee will measure students' achievement of learning outcomes and designate quality improvement actions to modify the program."

We will provide employment and needs surveys to regional employers. We keep in contact with employers and stakeholders through advisory boards, career fairs, internships and industry / USCA capstone projects. We also survey regional employers and conduct focus groups with our advisory boards to determine if our program is meeting employer needs as we do during the development of the programs. Feedback from all sources will be used for continual program improvement. This data is kept and archived by the dean of the college.

Will any of the proposed modifications impact the way the program is evaluated and assessed? If yes, explain.

☐ Yes

☒ No

Will the proposed modification affect or result in program-specific accreditation? If yes, explain; and, if the modification will result in the program seeking program-specific accreditation, provide the institution's plans to seek accreditation, including the expected timeline.

☐ Yes

☒ No

Will the proposed modification affect or lead to licensure or certification? If yes, identify the licensure or certification.

☐ Yes

☒ No

Explain how the program will prepare students for this licensure or certification.

If the program is an Educator Preparation Program, does the proposed certification area require national recognition from a Specialized Professional Association (SPA)? If yes, describe the institution's plans to seek national recognition, including the expected timeline.

☐ Yes

☒ No