NEW PROGRAM PROPOSAL FORM

Name of Institution: University of South Carolina Aiken

Name of Program (include degree designation and all concentrations, options, or tracks):
Bachelor of Science in Earth Systems Science

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.)

Consider the program for supplemental Palmetto Fellows and LIFE Scholarship awards?

- ☒ Yes
- ☐ No

Proposed Date of Implementation: Fall 2021

CIP Code: 40.0601

Delivery Site(s): University of South Carolina Aiken (USC Aiken)

Delivery Mode:

- ☒ Traditional/face-to-face
  *select if less than 25% online
- ☐ Distance Education
  - ☐ 100% online
  - ☐ Blended/hybrid (50% or more online)
  - ☐ Blended/hybrid (25-49% online)
  - ☐ Other distance education (explain if selected)

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

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Institutional Approvals and Dates of Approval (include department through Provost/Chief Academic Officer, President, and Board of Trustees approval):

Department: 8/23/19
College Council: 8/27/19
USC Aiken Faculty Assembly: 9/26/19
USC Aiken Chancellor Jordan: 10/30/19
USC System Board of Trustees: 12/17/19

Background Information

State the nature and purpose of the proposed program, including target audience, centrality to institutional mission, and relation to the strategic plan.

The Earth Systems Science Program (ESSP) at USC AIKEN offers a transdisciplinary approach to investigate the science of dynamic Earth processes. Through this program, students learn about and independently investigate complex environmental problems caused by human activities in conjunction with natural changes in the Earth system; equipping them for further study at the graduate level or for careers in a wide range of scientific fields. This unique program focuses on familiarizing students with processes and interactions of and amongst the four spheres of the Earth systems (atmosphere, biosphere, hydrosphere, and lithosphere) with core and elective program courses. Students may select from a cognate in biology or chemistry and can supplement their degree with courses offered in the College of Sciences and Engineering in order to fulfill specific education goals. In fulfillment of degree requirements, students will participate in research with geology faculty, gaining invaluable experience in field and laboratory research, and scientific communication – *in line with USC AIKEN's mission of encouraging research and creative pursuits and developing critical and creative writing, thinking, and communication skills*. Earth Systems Science Program courses will also fulfill USC AIKEN's General Education laboratory requirements.

Among the goals of USC AIKEN's Strategic Plan include creating new degree programs to complement traditional programs of study (Objective 2.1.1). Establishment of the ESSP meets this goal by filling a gap that currently exists for USC AIKEN students, as well as future students from around the Central Savannah River Area (CSRA) who wish to study earth and environmental sciences. By tailoring the degree program to an integrated Earth systems approach, rather than a more traditional geology degree, students prepare for a wide range of career opportunities and the potential for both local and global impact, given the nature of problems currently studied by earth scientists (Objective 1.1.2, Strategy 2.3).

Earth Systems Science is inherently transdisciplinary, integrating insights and concepts from many areas of study that converge on the interest of gaining a deeper understanding of the Earth system. Today, Earth systems scientists are working on a host of contemporary problems, such as developing predictive measures of future environmental conditions and their consequences for people, integrating observation systems to manage global and regional environmental change, and determining institutional, economic, and behavioral changes to enable effective steps toward global sustainability, to name a few. USC AIKEN's Earth Systems Science program will prepare students to be effective contributors to such problems as they become skilled in those areas of science, economics, and policy needed to tackle the world's most pressing social-environmental problems, becoming part of a generation of scientists, professionals, and citizens who approach and solve problems in a systematic, interdisciplinary way. Moreover, ESSP students will interact with the local community *via volunteering, K-12 education outreach, and internships (Strategy 4.1, Strategy 4.2). Our target audience includes students who wish to achieve a solid background in preparation for numerous career opportunities, including but not limited to the following:*

- Government agencies at the federal, state and local levels employ Earth System Scientists to regulate the use of natural resources, solve problems, and conduct research.
- Private industry provides jobs for Earth Systems Science graduates in exploratory geology, GIS, satellite imagery, and computer modeling, depending on training at an individual level. Private consulting firms hire Earth System Science graduates to work on environmental impact projects.
- Fisheries managers are tasked with maintaining fisheries at levels that will support sustainable fisheries, their related ecosystems, and the communities that depend on them.
- Technical careers (i.e. those related to the construction of buildings or transportation systems in marine or coastal areas) are available to Earth Systems Science graduates.
- Teaching and research positions in colleges and universities offer another area of career opportunities. Middle and high school teachers are in great demand, particularly in STEM fields.

USC AIKEN's Earth Systems Science Program will provide a curriculum that is commensurate with parts of several other programs across the state, including fieldwork and research opportunities, but offers a unique integrated approach not available at other universities. The nature of earth and environmental science inherently lends itself to immersive teaching techniques, particularly in the laboratory and field (USC AIKEN Objective 1.2.3); however, the geology faculty are also committed to implementing inquiry-based learning in the classrooms, using local settings and real-world data as teaching tools, and providing independent research opportunities for students in and outside of the classroom (USC AIKEN Objectives 1.2.1, 1.2.2., and 1.2.3).

Assessment of Need

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

Presently, students within the CSRA (including students in Richmond and Columbia counties, GA) who are interested in pursuing higher education in earth and environmental science are limited in their choice of institution. Such degree programs do not exist at any campus in the CSRA; namely USC AIKEN, Augusta University, Limestone College, Aiken Technical College, Paine College, Strayer University, and Voorhees College. Consequently, CSRA students with academic and career interests in earth sciences must either 1) attend USC AIKEN to pursue education and job training in a secondary field of interest, or 2) attend USC AIKEN to complete general education degree requirements and then transfer to another institution outside of the CRSA. Hence, the addition of a degree program in Environmental Systems Science at USC AIKEN will fill a scholastic void within the CSRA and will foster an immediate and long-lasting proliferation of the USC AIKEN student body through enhanced recruitment and retention.

Student interest in pursuing a degree in earth and environmental science at USC AIKEN is demonstrated in the following ways:

- increased enrollment numbers in upper-level geology courses presently offered;
- increased participation in earth science-related research with geology faculty; and
- transfer of a number of students to other universities to pursue a degree in an earth-science related field at both the undergraduate and graduate level

At present, USC AIKEN students have the option to choose a minor (15 credits) or cognate (12 credits) in geology. Several upper-level geology courses (i.e., 300-level or higher) are offered in the current curriculum to fulfill these needs. Even without a degree program, since 2017 these courses have typically filled to course cap limits (15 students per class); particularly those that are in line with the goals of the proposed Earth Systems Science Program (GEOL A311 Paleontology, GEOL A401 Environmental Geomorphology, and GEOL A363 Geographic Information Systems (GIS) in the Sciences). Increasing student interest in earth systems science has also driven two changes. First, the department has shifted from offering a single upper division geology course each semester to two, with associated sustained high enrollment. Secondly, two new upper division geoscience courses have been adopted for the existing program beginning Fall 2019 (GEOL A301 Oceanography and GEOL A405 Global Biogeochemical Cycles). These courses presently support students whose only option is a minor or cognate; thus, we expect demand and enrollment to grow in a degree-granting program. Each year, 1-2 students transfer to other institutions with an expressed desire in majoring in an earth-science related field.

In addition to high class enrollment, Drs. Gibson and Sullivan, geologists who each joined the department within the last three years, have mentored a number of biology majors on independent geology research projects, as well as paid internships. Of these students, one has received USC Aiken Summer Scholars Institute funding, five have received summer research assistantships through externally and internally funded grants, eight have presented posters or talks at local and regional conferences and meetings, and one is co-author on a peer-reviewed publication. Furthermore, two students have gone on to pursue a graduate degree related to, or utilizing skills, attained during

independent research experiences in the Gibson and Sullivan labs. For the summer of 2019, the Sullivan lab will employ three summer research assistants and Gibson lab will have one student researcher. Each lab has three students under contracts for independent student research in Fall 2019. These numbers indicate sustainable interest levels of our current students in earth science related-research topics and support the need for a dedicated geology degree program.

The strength of the degree programs in the Department of Biology and Geology is the ability for students to integrate hands-on research as early as possible within their undergraduate careers, which provides invaluable practical research experience that lends itself to success in the workforce or in graduate school. The Earth Systems Science Program will extend these opportunities by providing graduates valuable experience with the scientific method, research practices, and written and oral communication. In this way graduates will be highly competitive in both the job and academic markets. The motivation, aptitude, and post-undergraduate career choices of our current students indicate a strong framework for continued excellence in teaching and research at USC AIKEN through the proposed Earth Systems Science Program.

Beyond the university level, there is a strong regional and statewide need for qualified individuals in earth science related fields. From water to energy, and from climate change to natural hazards, the earth sciences explain the workings of the Earth System, provide the basis for developing best practices for human interactions with Earth systems, and therefore should be firmly integrated into educational pathways (Bralower et al., 2008; Gosselin, et al., 2015)[1,2]. At a state and regional level, agencies are recognizing of the impacts of human activity and global climate change on nearly every social and economic sector. For example, recent efforts are actively underway at state and local levels to manage groundwater (https://www.scdhec.gov/environment/water-quality/groundwater-use-reporting/groundwater-management-planning/groundwater), develop and safely utilize alternate energy sources and their associated waste products (https://www.boem.gov/South-Carolina/; https://www.srs.gov/general/news/factsheets/srr_saltstone.pdf), and prepare coastal and inland regions for rising sea level and tropical cyclone impacts (https://www.charleston-sc.gov/DocumentCenter/View/20299). Graduates of USC AIKEN's Earth Systems Science Program will be qualified to both enter the environmental workforce directly and to pursue a graduate degree in fields of study relevant to the aforementioned efforts, including, but not limited to environmental science, remediation, consultation, environmental education, and natural resource and coastal zone management.

We anticipate our program to be a source of potential graduate students to the School of Earth, Ocean, and Environmental Sciences at the University of South Carolina Columbia. To that end, the director of the SEOE is supportive of our program and mission, and the SEOE faculty have expressed enthusiasm for the development and implementation of USC AIKEN's Earth Systems Science Program.

[1] Bralower T.J., P.G. Feiss and C.A. Manduca (2008), Preparing a new generation of citizens and scientists to face earth's future. *Liberal Education*, 20-23.

[2] Gosselin, D., S. Burian, T. Lutz, and J. Maxson (2015), Integrating geoscience into undergraduate education about environment, society, and sustainability using place-based learning: Three examples, *Papers in the Earth and Atmospheric Sciences*, 441.

Transfer and Articulation

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

Statewide Technical School to Public School articulations; no articulation agreements for this program (https//www.sctrac/org/Student/Statewide-Transfer-Articulation-in-SC).

Employment Opportunities

Occupation	South Carolina		United States		Data Type and Source
	Expected Number of Jobs (2026)	Employment Projection (jobs per year)	Expected Number of Jobs (2026)	Employment Projection (jobs per year)	
Geographic Information Systems Technicians	1,740	+8% growth (120 per year)	313,800	9% growth (22,400 per year)	Onetonline.org
Mapping Technicians	1,320	+9% growth (140 per year)	66,600	11% growth (7,200 per year)	Onetonline.org
Water/Wastewater Engineers	910	+9% growth (60 per year)	58,300	8% growth (4,000 per year)	Onetonline.org
Natural Sciences Managers	570	+17% growth (50 per year)	62,300	10% growth (5,200 per year)	Onetonline.org
Environmental Restoration Planners	490	+15% growth (50 per year)	9,500	11% growth (9,500 per year)	Onetonline.org
Environmental Scientists and Specialists, Including Health	490	+15% (50 per year)	99,400	11% growth (9,500 per year)	Onetonline.org
Soil and Water Conservationalists	290	+9% (30 per year)	23,700	6% growth (2,000 per year)	Onetonline.org
Environmental Science and Protection Technicians, Including Health	250	+13% (13 per year)	38,800	12% growth (4,600 per year)	Onetonline.org
City and Regional Planning Aides	240	+7% (30 per year)	35,500	4% growth (4,100 per year)	Onetonline.org
Geoscientists, except Hydrologists and Geographers	210	+16% growth (20 per year)	36,500	14% growth (3,500 per year)	Onetonline.org
Remote Sensing Technicians	210	+10% (30 per year)	83,500	10% growth (9,900 per year)	Onetonline.org
Curators	170	+9% (20 per year)	14,100	14% growth (1,500 per year)	Onetonline.org
Remote Sensing Scientists and Technologists	150	+6% Growth (10 per year)	25,100	7% growth (2,000 per year)	Onetonline.org
Hydrologists	130	+6% growth (10 per year)	7,400	10% growth (700 per year)	Onetonline.org
Atmospheric, Earth, Marine, and Space Sciences Teachers, Postsecondary	120	+10% growth (10 per year)	14,400	10% growth (1,200 per year)	Onetonline.org
Geological Sample Test Technicians	60	+8% (10 per year)	17,400	16% growth (1,900 per year)	Onetonline.org
Geological and Petroleum Technicians	60	+8% (10 per year)	17,400	16% growth (1,900 per year)	Onetonline.org

TOTALS	**7,410**	**663 per year**	**893,700**	**91,100 per year**	

Supporting Evidence of Anticipated Employment Opportunities

Provide supporting evidence of anticipated employment opportunities for graduates.

A Bachelor of Science in Earth Systems Science will prepare students for positions in environmental health, consulting, remediation, testing, quality control and management, including coastal and water resources, geology and hydrology research and consulting, forestry and soil-science services, GIS and land surveying occupations, education, and outreach. Specific position titles, job availability (2019) and median entry-level salary are listed below for several examples of these positions. The numbers in the table above reflect positions for which the job title may vary slightly from the position description (e.g. "Staff Scientist"; "Field Technician"); as such the numbers below are somewhat restrictive. Positions are available both through state agencies (e.g. https://scdhec.gov/about-dhec/jobs-careers; http://www.dnr.sc.gov/admin/dnrhr.html, http://www.scseagrant.org/) and private companies throughout South Carolina. Although these numbers reflect statewide potential, within the Central Savannah River Area, positions are available through the Aiken County and Columbia County Governments (including two GIS positions[3] and an environemtal project specialist position[4]), consulting/contracting firms such as Navarro Research and Engineering, Inc, North Wind Portage, Inc, (multiple geologist and environmental positions[5] [6]) that support environmental projects with the Department of Energy or independent projects, and multiple secondary and university level teaching positions[7] [8]. Growth is projected in multiple sectors at the Savannah River Site and its contractors over the coming years, both in response to retirements and new contracts.

See attached letters of support.

Position	**Available Jobs in SC** [9]	**Median Salary in SC**
Environmental Consultant	63	$60,333[10]
Environmental Engineer (EL)	50	$58,877[11]
Land Surveyor (EL)	63	$43,850[12]
GIS Analyst*	11	$44,704[13]

Position	**Available Jobs in SC** [14]	**Median Salary in SC**
Geologist (Entry Level)	11	$42,649[15]
Wastewater Operator/Tech	42	$43, 423[16]
Primary/Secondary Educator	182	$52 985[17]
Lecturer/Faculty	4	$60,264[18]

[3] https://www.aikencountysc.gov/acjobs
[4] https://www.indeed.com/jobs?q=environmental%20science&l=Aiken%2C%20SC&vjk=f4604d8e5d7fa0b0
[5] https://www.indeed.com/jobs?q=environmental%20science&l=Aiken%2C%20SC&vjk=f4604d8e5d7fa0b0
[6] https://jobs.scworks.org/vosnet/jobbanks.joblist.aspx
[7] https://www.indeed.com/jobs?q=environmental%20science&l=Aiken%2C%20SC&vjk=f4604d8e5d7fa0b0
[8] https://jobs.scworks.org/vosnet/jobbanks.joblist.aspx
[9] https://jobs.scworks.org/vosnet/Default.aspx?enc=vLa15KtdCzQQMP6jrcRdIQ==
[10] https://www.indeed.com/salaries/Environmental-Consultant-Salaries,-South-Carolina
[11] https://www1.salary.com/SC/Environmental-Engineer-I-Salary.html
[12] https://www1.salary.com/SC/Land-Surveyor-I-Salary.html
[13] https://www1.salary.com/SC/GIS-Analyst-I-Salary.html
[14] https://jobs.scworks.org/vosnet/Default.aspx?enc=vLa15KtdCzQQMP6jrcRdIQ==
[15] https://www1.salary.com/SC/Geologist-I-salary.html
[16] https://www.indeed.com/salaries/Wastewater-Operator-Salaries,-South-Carolina
[17] https://www1.salary.com/SC/Public-School-Teacher-salary.html
[18] https://www.indeed.com/salaries/Professor-Salaries,-South-Carolina

Description of the Program

Projected Enrollment			
Year	Fall Headcount	Spring Headcount	Summer Headcount
2021	10	10	0
2022	15	15	0
2023	23	23	0
2024	30	30	0
2025	30	30	0

Explain how the enrollment projections were calculated.

Enrollment projections are calculated based on number of students in upper division geology courses who have expressed an interest in an Earth Systems Science degree program at USC AIKEN, the number of students who transferred to other institutions to pursue geoscience related fields, and the number of incoming freshmen advisees that express interest in a geology degree program. The numbers for years 1-2 are conservative estimates, as they are limited to the population of students that Dr. Gibson, Dr. Dennis, and Dr. Sullivan interact with in their classes or during advisement. We expect these numbers to grow substantially in years 2-3 as awareness of the new and exciting opportunities offered through the Earth Systems Science degree increases.

Each semester there are a minimum of three sections of introductory level geology courses (GEOL A101 Physical Geology, GEOL A102 Historical Geology, and GEOL A103 Environmental Earth Science) taught amongst the three geology faculty. We believe this will ensure stable/sustainable student recruitment.

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

☐Yes

☒No

Curriculum

New Courses

List and provide course descriptions for new courses.

Geol A301: Oceanography (beginning Fall 2019) (4 semester hours) Prereq: C or better in Geol A101 Physical Geology or Geol A103 Environmental Earth Science, and Chem A111 General Chemistry I

An integrated overview of the geology, chemistry, physics, and biology of the world's oceans. Topics include the evolution of the ocean basins, physical and chemical properties of seawater, ocean circulation, waves, and coastal processes, and the ocean's major biological communities. Issues of current interest (e.g. climate change; coral bleaching; invasive species; ocean acidification) are presented throughout the course. Three lecture hours and three laboratory hours per week. Required field trips.

Geol A303: Synoptic Meteorology (beginning as GEOL A398 Fall 2020) (4 semester hours) Prereq: C or better in Geol A101 Physical Geology or Geol A103 Environmental Earth Science

This course focuses on the physical processes that influence weather and climate patterns on the earth and provides a synoptic-scale assessment of atmospheric circulation using weather maps, soundings, cross sections, thermodynamic diagrams, numerical models, and remote sensing. Three lecture and three laboratory hours per week.

Geol A302*: The Anthropocene (3 semester hours) Prereq: C or better in Geol A103 Environmental Earth Science or instructor consent

This course will be offered for the first time as an IDST 398 class in Spring 2020. The Anthropocene was formally proposed in 2000, and marks the dawn of Earth's newest geologic epoch during which humanity's impact on the Earth System has rivaled that of the great geological forces. Many scientists believe that since the 1950's humanity has resided in the Great Acceleration; a time of enhanced globalization, marketing, tourism and investments that fueled enormous growth on a global scale and vastly increasing human-environmental interactions. Others believe the dawn of the "Human Planet" began over 200,000 years ago when the earliest humans came into the picture. In this course we will take an interdisciplinary approach to explore the various perspectives on the Anthropocene concept, and will study the ways in which human activity has changed Earth's biophysical system; building an appreciation for how humanity is embedded in an open, dynamic and rapidly changing Earth System. Three lecture hours per week. Required field trips, one week-long trip to South Florida over Spring Break.

Geol A405: Global Biogeochemistry (Beginning Fall 2019) (4 semester hours) Prereq: C or better in Biol A122 Biological Science I and Chem A111 General Chemistry I and either Geol A101 Physical Geology or Geol A103 Environmental Earth Science

This course provides an integrated and quantitative perspective on the processes that cycle biologically important elements through the Earth systems and the relationship of those processes to global change in the past, present, and future. Topics include feedback loops, redox processes, nutrient cycling, gas flexes, modeling approaches, and how humans have modified Earth's biogeochemistry. Three lecture and three laboratory hours per week. Required field trips.

*****In the current course catalogue, GEOL A102 Historical Geology is the only listed course that is writing intensive (WI). Both GEOL A302 The Anthropocene and GEOL A325 Sedimentology and Stratigraphy will be converted to writing intensive courses to ensure sufficient opportunity for majors to satisfy the USC AIKEN WI requirement.

Total Credit Hours Required: 120
Example curriculum for a B.S. in ESSP (44 program hours). Cognates are offered in Chemistry (12 credit hours) and Biology (12 credit hours).

Curriculum by Year					
Course Name	**Credit Hours**	**Course Name**	**Credit Hours**	**Course Name**	**Credit Hours**
Year 1					
Fall		**Spring**		**Summer**	
GEOL A101 or GEOL A103	4	GEOL 102	4		
MATH A108	3	MATH A122 or MATH A141	3-4		
BIOL A122	4	CHEM A111	4		
ENGL A101	3	ENGL A102	3		
AFCI A101	1				
Total Semester Hours	15	Total Semester Hours	14-15	Total Semester Hours	
Year 2					
Fall		**Spring**		**Summer**	
GEOL A301	4	GEOL A331 or GEOL A405	4		
BIOL A121	4	Cognate course	4		
Foreign Language	4	Foreign Language	4		
HIST A101	3	COMM A201	3		
Total Semester Hours	15	Total Semester Hours	15	Total Semester Hours	

Course Name	Credit Hours	Course Name	Credit Hours	Course Name	Credit Hours
Year 3					
Fall		**Spring**		**Summer**	
GEOL A325	4	GEOL A401	4		
GEOL A363	4	GEOL A431	4		
Cognate Course	4	Cognate course	4		
Humanities	3	Humanities	3		
Total Semester Hours	15	Total Semester Hours	15	Total Semester Hours	
Year 4					
Fall		**Spring**		**Summer**	
GEOL A303	4	GEOL A331 or A405	4		
Humanities	3	GEOL A490/499	4		
Social Science	3	Social Science	3		
Elective	3	POLI A201	3		
Elective	3				
Total Semester Hours	16	Total Semester Hours	14	Total Semester Hours	
Year 5					
Fall		**Spring**		**Summer**	
Total Semester Hours		Total Semester Hours		Total Semester Hours	

Similar Programs in South Carolina offered by Public and Independent Institutions

Identify the similar programs offered and describe the similarities and differences for each program.

Program Name and Designation	Total Credit Hours	Institution	Similarities	Differences
Earth & Environmental Science (BA)	120	Furman University	Some course overlap, similar math requirements and a research capstone.	More rigorous and diverse course requirements and integrated systems approach (Bio/Hydro/Atmo/Pedo/Antrhopospheres), stronger biology/chemistry focus at USC AIKEN.
Earth & Environmental Science (BS)	120	Furman University	Some course overlap, similar math requirements and a research capstone.	Integrated systems approach in one unified degree at USC AIKEN providing broad training for diverse career options.
Geological Sciences (BS)	120	USC Columbia	The core courses are similar to the "Pedosphere" courses at USC AIKEN, as well as a Maymester field component.	Integrated systems approach in one unified degree at USC AIKEN providing broad training for diverse career options; stronger emphasis on undergraduate research at USC AIKEN.
Geology (BS)	120	Clemson University	The core courses are similar to the "Pedosphere" courses at USC AIKEN, and students can participate in research for course credit.	Integrated systems approach in one unified degree at USC AIKEN providing broad training for diverse career options. The program at Clemson has a strong focus on Physical Geology.
Geology (BA, BS)	120	College of Charleston	The core courses are similar to the "Pedosphere" courses at USC AIKEN; some overlap with electives and similar senior seminar and field course opportunities.	Integrated systems approach in one unified degree at USC AIKEN providing broad training for diverse career options; research opportunities for course credit at USC AIKEN.

Faculty

Rank and Full- or Part-time	Courses Taught for the Program	Academic Degrees and Coursework Relevant to Courses Taught, Including Institution and Major	Other Qualifications and Relevant Professional Experience (e.g., licensures, certifications, years in industry, etc.)
Professor, Full Time	GEOL A101, GEOL A102, GEOL A331, GEOL A431	A.B. Geology, 1982, Colgate University M.S. Geology, University of South Carolina, 1985 Ph.D., Geology, University of South Carolina 1989.	**Teaching Experience:** Lab supervisor at Colgate University (1982 – 1983); Field camp instructor, Colgate University (1983) Teaching Assistant USC Columbia (1984 – 1988): Field methods and structural geology, Environmental and physical geology; Senior undergraduate research project director USC AIKEN: Instructor (1988-1992); Research Assistant Professor (1990-1992); Assistant Professor (1992-1995); Associate Professor (1992-1995); Professor (2000 - present). Courses taught include physical, historical environmental geology, integrated earth science, mineralogy and structure geology, and field courses specializing in the Southern Appalachians and coastal geology. Received Big Earth Science Teaching Award, GSA (1994), Governor's Distinguished Professor Award (1995) **Scholarship:** 18 peer-reviewed first and co-authored manuscripts, 15 field guides and reports, 78 conference abstracts, 9 funded grants, and mentored undergraduates at USC AIKEN. As graduate faculty, USC Columbia (1996-2001); supervised 1 PhD and 1 MS student, committee member for 3 PhD students and 1 MS student. Citationist Best Publication Award (2013, 2008), Elected Fellow GSA (2002), Scholarly Activity Award at USC AIKEN (2008). **Service, Outreach, and Leadership:** USC AIKEN Dept of Bio/Geo Dept Chair (1998-2004). USC AIKEN Faculty Assembly Chair (2008-2010); FA committees include: Faculty Advisory, Faculty Welfare, Campus Budget, Strategic Planning, Campus Technology, Nominating Committee, C&C, NFO. Additional service: Chair of ad hoc Faculty Senate Bylaw committee (2013-2014), Salary Enhancement Prioritization Plan Committee (2015), Judicial Advisors Pool, Geology faculty search committees, Faculty Annual Revision Committee;

			Strategic Planning Steering Committee (2001-2003). USC Board of Trustees to Academic Affairs and Faculty Liaison Committee (2010-2011); USC Board of Trustee Carolina Trustee Professor (2010) Trip leader, GSA (1988; 2000; 2007; 2016); Carolina Geological Society Organizer and Field Trip Leader (1995, 2000, 2014); President (1997-1998), Vice President (1996-1997); Board member (1995-1999; 2012, 2015-2018); GSA Co-convener (2012, 2000, 1988); President (1995-1996), VP (1994-1995), Councilor (1996-1998) CSRAGS Editor of South Carolina Geology (1995), reviewer for 13 international peer-reviewed journals, NSF, ISF, Petroleum Research Fund of the ACS **Professional Affiliations:** AGU, GSA, Carolina Geological Society, Sigma Xi, International Association of Structural and Tectonic Geologists, CSGAGS
Assistant Professor, Full Time	GEOL A101, GEOL A103, GEOL A303, GEOL A325, GEOL A405	B.S. Geology, 2004, The College of William and Mary. Relevant coursework: Physical Geography, Marine Geology, Mineralogy, Sed/Strat, Environmental Geology, Structural Geology, Earth History, Hydrology, Surface Processes, Regional Field Geology, Intro to Geologic Research, Senior Research, Physics I&II, Gen Chem I&II, Calculus. PhD Marine Geology and Geophysics, University of Miami's Rosenstiel School of Marine and Atmospheric Science (RSMAS). Relevant Coursework: Sedimentary Petrology, Plate Tectonics, Oceanography II, Geophysics, Basin Analysis, Paleoclimatology, Biological Oceanography,	**Teaching Experience:** Teaching Assistant RSMAS (2007-2012) MSCI 111 – Intro to Marine Science, MSCI 424 - Origin and Geology of the Galapagos Islands Postdoctoral Associate at USC Columbia (2013-2016), Adjunct Assistant Professor at USC Columbia (2016 – present); teaching experience includes MSCI 313 (Chemical Oceanography) and MSCI 210 (Oceans and Society) and several guest lectures Instructor at USC AIKEN (2017-2019): GEOL A101, GEOL A201, GEOL A311, GEOL A398; Assistant Professor at USC AIKEN (2019 – present): GEOL A101, GEOL A201. Selected participant in NSF-sponsored PDBD Teaching Hackathon (2018). **Scholarship:** 8 peer-reviewed authored or coauthored manuscripts, 7 research grants (2 mentored students), 3 invited talks, 11 conference abstracts, and 12 undergraduate students mentored as grad student, postdoc, and instructor. **Professional development**:

		Earth Surface Systems, Scanning Electron Microscopy, Stable Isotope Geochemistry, Carbon and Climate, Biogeochemical Exploration of the Ocean Basins, Seminar.	Preparing for an Academic Career in the Geosciences (2012); Marine Geoscience Leadership Symposium, Washington DC (2015); Preparing Future Faculty Program, USC CTE (2016); USC AIKEN CTE Lunch and Learn (2017) **Service, Outreach, and Leadership:** USC AIKEN FA New Faculty Orientation Committee (2019-present), USC AIKEN Bio/Geo Recruitment and Retention Committee (2018-present), USC AIKEN Bio/Geo Microbiology Search Committee Member (2018), USC AIKEN Jury Pool (2017-present), USC Postdoc Association Secretary/Treasurer (2014-2015), Marine Science Graduate Student Organization Treasurer (2007-2008; RMSAS), Tour Guide (2008-2012; RSMAS), Seminar Chair (2006-2007; RSMAS), judge at numerous regional/local science fairs (2011-present), peer reviewer for 3 international journals, USC Magellan, ASPIRE, HITP, and NSF OCE/MGG proposals **Professional Affiliations:** National Association of Geoscience Teachers, Earth Science Women's Network, American Geophysical Union, Geological Society of America.
Assistant Professor, Full Time	GEOL A103, GEOL A303, GEOL A363, GEOL A401, GEOL A302	B.S. Marine Science, 2005, University of South Carolina. Relevant coursework: Gen Chemistry I and II, Organic Chemistry, Calculus I and II, Vector Calculus, Gen Physics I and II, Cartography, Remote Sensing, Oceanography I and II, Ocean Data Analysis, Interpretation of Aerial Photos, GIS, Advanced GIS, Synoptic Meteorology, Biology of Marine Organisms, Physical/Chemical Oceanography, Senior Research. PhD Geological Sciences, 2015, University of South Carolina. Relevant coursework: Satellite Mapping and GPS,	**Teaching Experience:** USC (2009-2015) – Teaching assistant for GEOL A103 Environmental Earth Science, GEOL A315 Surface and Near Surface Processes, GEOL 502 Principles of Coastal Geomorphology USC AIKEN (2016-present) – Assistant Professor of Geology, GEOL A103 Environmental Earth Science, GEOL A363 GIS in the Sciences, GEOL A401 Environmental Geomorphology, IDST A398/GEOL A302 The Anthropocene **Scholarship:** 7 authored or coauthored manuscripts (2 in review), 6 grants, 3 invited talks, 11 conference abstracts, and 12 undergraduate students mentored as grad student or professor. **Professional Experience:** South Florida Water Management District (2015-2016) – Scientist IV, City of Columbia (2007-2009) – GIS Analyst, City of Charleston (2006-2007) – GIS Technician,

		Seminar in Climatology, Fluid Mechanics, Earth Resource Management, Physical Oceanography, Elementary Differential Equations, Lidar and Photogrammetry, Air-Sea Interaction, Environmental measurement and Analysis, Estuarine Oceanography, Analysis of Geologic Data, Applied Numerical Methods, Principles of Coastal Geomorphology, Geophysical Fluid Dynamics, Seminar in Geomorphology	Southeast Regional Climate Center (2005-2006) – Intern, Geographic Information Processing lab (2004-2005) – Undergraduate research assistant. **Service, Outreach, and Leadership:** USC AIKEN Academic Services Committee (chair), USC AIKEN Nominating Committee, USC AIKEN New Faculty Orientation Committee Member, USC AIKEN Bio/Geo Microbiology Search Committee Member, USC AIKEN Bio/Geo Awards Honors and Scholarships Committee (chair), USC AIKEN SEED Day Volunteer, USC AIKEN Anime Club Advisor, PhD graduate student Committee Member, K-12 outreach in the geosciences, judge at numerous regional/local science fairs, peer reviewer for 4 international journals and Magellan proposals **Professional Affiliations:** Geophysical Union, Coastal and Estuarine Research Federation, Southeastern Estuarine Research Society.

Total FTE needed to support the proposed program:
Faculty: 3
Staff: 0.5
Administration: 0.25

Faculty, Staff, and Administrative Personnel

Discuss the Faculty, Staff, and Administrative Personnel needs of the program.

Our three three full time faculty members (one Professor and two Assistant Professors) will provide the majority of the introductory courses and all upper division courses required to graduate students in a timely manner. Evening sections of GEOL A101 Physical Geology and GEOL A103 Environmental Earth Science are currently taught by two adjunct faculty members.

This degree program takes advantage of current full time staffing and maintains teaching loads at the level expected of all USC Aiken faculty (12 contact hours per semester). In developing this program, we have created a course rotation that mixes lower-division prerequisites with upper division courses specific to the major. In doing so, we have maintained current teaching loads and maximized course availability for student progression.

Currently, the geology faculty participate in advisement of biology majors. Once this program is approved, geology faculty will advise geology majors (shifting the biology majors to other faculty). Therefore, there will be no change in faculty advisement loads.

The department has a full time lab instructor/lab manager who handles lab supplies for both biology and geology (the 0.5 Staff listed above). Similarly, the department has an existing Administrative Assistant shared with the Department of Chemistry and Physics (the 0.25 administration listed above is the current and future amount needed).

Resources

Library and Learning Resources

Explain how current library/learning collections, databases, resources, and services specific to the discipline, including those provided by PASCAL, can support the proposed program. Identify additional library resources needed.

Through the Gregg-Graniteville Library, students have access to more than 140,000 print volumes, 4,600 media, 200 electronic databases, 125,000 e-journals, 20,000 streaming video titles, 200,000 musical audio recordings (physical and streaming), and 400,000 e-books. The library provides access to an adequate number of databases relevant to earth systems sciences for students in the proposed program including GeoScience World, GeoRef, Science Direct, and Web of Science. Over 600 earth and atmospheric sciences, 220 geology, 100 forestry, 200 oceanography, and 1800 biology electronic journal titles are available. Electronic monograph holdings in environmental sciences and climate change are strong. The monograph collection is weaker in geology and geographic information systems. It is the suggestion of the Library that more current monograph titles in these areas should be acquired to strengthen the collection and would require an additional $2,000 annually to supplement the current library collection budget.

The current library instruction program and reference services are adequate to meet these students' needs. As with other departments on campus, the Biology and Geology department is supported by a library liaison program in which a dedicated librarian and faculty member collaborate on collection development and instruction planning and feedback. Interlibrary Loan and PASCAL Delivers are also available for students and faculty.

Student Support Services

Explain how current academic support services will support the proposed program. Identify new services needed and provide any estimated costs associated with these services.

Existing Academic Support Services: USC AIKEN offers many academic support services that will support the proposed degree program. These services include the Center for Student Achievement, Computer Services/IT, Counseling Services, Disabilities Services, and Instructional Laboratories (e.g. Math Lab and Writing Room). Brief descriptions of how each academic service will benefit the Earth Systems Science Program is provided below.

Center for Student Achievement: In general, this service will encourage the academic success of Earth Systems Science students by assisting them in developing educational plans, connecting them with campus resources, and promoting engaged learning and personal responsibility. This service offers specific programs that will help ESSP students, such as First-Year Seminar, Academic Success and Writing Room Workshops, Academic Consultations, and Academic Advisement.

Computer Services Division (CSD): CSD will provide Earth Systems Science students with the computing, networking, and voice communication tools necessary to support student academic goals, and is committed to providing students with a reliable, state-of-the-art computational environment. USC AIKEN offers a computing resource lab that contains an open Windows and Macintosh computer lab, and a similar environment in the Science Building is dedicated to students in the Department of Biology and Geology. Students have continuous access to these facilities 24 hours a day, 7 days a week. CSD also provides network and wireless services for students and provides them with electronic mail, network printing, file sharing, and network applications.

Counseling Services: Earth Systems Science students will benefit from professional, short-term counseling, and these services are free and confidential. Counseling topics may include study skills,

college adjustment issues, communication skills, relationship issues, or other interpersonal concerns and mental health issues such as stress, depression and anxiety. The Counseling Center also offers programs for alcohol and drug abuse assistance, and an advocate from the Cumbee Center to Assist Abused Persons is also available through the counseling center.

Disability Services: Earth Systems Science students with physical, psychological, or learning disabilities will receive assistance through the Office of Disabilities services with the goal that all student programs and services are accessible. This service begins during the admission process and ends when the student graduates.

Instructional Laboratories

Math Lab: Earth Systems Science students will receive support in mathematics courses, and other math intensive courses in the program. Specifically, students are offered free peer tutoring in any freshman level and selected sophomore level math class, and assistance with calculator skills and computer software.

Writing Room: Earth Systems Science students will have access to writing tutors from a range of disciplines that are formally trained to provide feedback during all phases of the writing process.

Existing Campus Services: Earth Systems Science students will also benefit from the numerous campus services existing at USC AIKEN. These campus services include Athletic Recreational Facilities, ATMs, Behavioral Intervention Teams, childcare facilities (Children's Center), Dining Services, Parking, Student Health Center, University Police, Wellness Center/natatorium, and the Student Activities Center.

The Department of Biology and Geology has requested the implementation of lab fees for GEOL A101 Physical Geology and GEOL A103 Environmental Earth Science to support ESSP independent research projects, and teaching and lab supply costs. This is in line with the current practice in biology. Courses with extra fees will be specified in the Academic Bulletin.

Physical Resources/Facilities

Identify the physical facilities needed to support the program and the institution's plan for meeting the requirements.

Existing physical facilities include classroom and lab space sufficient for introductory and upper division courses. Available classrooms can accommodate numbers from 24 (Science 200, 212, and 216) to 140 (Science 327). Laboratory sections are capped at 24 students and are generally taught in geology-dedicated rooms (Science 216 and 212). Shared laboratory space for faculty and student research exists for all three faculty members (Sci 214 and Sci 218), with sinks, working fume hoods, and gas and air lines. University and department vehicles exist for field trip and field work transportation.

Needed: None currently.

Equipment

Identify new instructional equipment needed for the proposed program.

No major instrumentation is required. General teaching supplies, including rock, sediment and fossil collections, general labware, and basic field equipment should be restocked to ensure adequate numbers of supplies for all students, as well as complete collections. In support of these costs, the Department of Biology and Geology earmarks approximately $15/student (enrolled in laboratory courses) from the annual budget to purchase required teaching supplies. Because this proposal does not change the number of geology courses offered per semester, our current annual budget will not be overtaxed. Because a number of the items are not consumable (e.g., rock, sediment, and fossil collections) it is anticipated that the costs per course will be below the 15$/student level. Based on current spending levels, we anticipate annual costs for educational supplies to be less than $3,000.

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												
	1st		2nd		3rd		4th		5th		Grand Total	
Category	**New**	**Total**	**New**	**Total**	**New**	**Total**	**New**	**Total**	**New**	**Total**	**New**	**Total**
Tuition Funding	103,980	103,980	155,970	155,970	239,154	239,154	311,940	311,940	311,940	311,940	1,122,984	1,122,984
Program-Specific Fees	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	24,000	24,000
Special State Appropriation	0	0	0	0	0	0	0	0	0	0	0	0
Reallocation of Existing Funds	0	225,858	0	225,858	0	225,858	0	225,858	0	225,858	0	1,129,290
Federal, Grant, or Other Funding	0	0	0	0	0	0	0	0	0	0	0	0
Total	108,780	334,638	160,770	386,628	243,954	469,812	316,740	542,598	316,740	542,598	1,146,984	2,276,274
Estimated Costs Associated with Implementing the Program by Year												
	1st		2nd		3rd		4th		5th		Grand Total	
Category	**New**	**Total**	**New**	**Total**	**New**	**Total**	**New**	**Total**	**New**	**Total**	**New**	**Total**
Program Administration and Faculty/Staff Salaries	0	225,858	0	225,858	0	225,858	0	225,858	0	225,858	0	1,129,290
Facilities, Equipment, Supplies, and Materials	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	15,000	15,000
Library Resources	2,000*	2,000*	2,000*	2,000*	2,000*	2,000*	2,000*	2,000*	2,000*	2,000*	10,000*	10,000*
Other (specify)	0	0	0	0	0	0	0	0	0	0	0	0
Total	5,000	230,858	5,000	230,858	5,000	230,858	5,000	230,858	5,000	230,858	25,000	1,154,290
Net Total (Sources of Financing Minus	103,780	103,780	155,770	155,770	238,954	238,954	311,740	311,740	311,740	311,740	1,121,984	1,121,984

Estimated Costs)												

Note: New costs - costs incurred solely as a result of implementing this program. Total costs - new costs; program's share of costs of existing resources used to support the program; and any other costs redirected to the program.

Budget Justification

Provide an explanation for all costs and sources of financing identified in the Financial Support table. Include an analysis of cost-effectiveness and return on investment and address any impacts to tuition, other programs, services, facilities, and the institution overall.

Tuition is $5,199/full time semester. Year 1 tuition is $5,199 x 20 students = $103,980, and so on until we reach a proposed steady-state of 30 students each semester.

Faculty salaries: three tenured or tenure-track faculty are already employed at USC Aiken. Their salaries are reflected in both the estimated cost section and the reallocation of existing funds. There is no new faculty cost to initiate and establish this degree program.

*Library resources (monographs) are suggested costs, not mandated to start and operate the program.

Evaluation and Assessment

Program Objectives	Student Learning Outcomes Aligned to Program Objectives	Methods of Assessment
Deliver a broad yet comprehensive overview of the processes that operate within and amongst the earth systems with an appreciation of the time and spatial scales on which these processes occur, and the relationship of society to the earth systems.	Students will demonstrate an understanding of the processes that operate in the atmosphere, biosphere, hydrosphere, lithosphere, and the interconnectedness of earth systems. Students will evaluate processes in each of these spheres in the past and present, and on the variety of spatial and temporal scales on which they operate. Students will gain an appreciation of the interaction of society with the natural environment, and the implications of earth system processes and societal functioning in the present and future.	Pre/Post Tests at the onset and completion of degree program; exit interviews
Develop technical and practical skills related to earth science that are applicable to a diverse range of academic and career pursuits	Students will demonstrate proficiency in basic computing processes required for a career or further study in an earth science related discipline. Students will gain practical experience with earth systems science laboratory techniques, field methods, and models by which researchers strive to understand the natural world. Students will be comfortable working independently to develop a research question, conduct experiments or gather data, and process the data for wider dissemination in academic and public fora.	Laboratory practicals, required field methods courses and/or field trips with evaluation; independent research capstone classes with one of the three geology faculty or an approved affiliate.
Refine students' oral and written communication skills with respect to complex scientific background, data, and implications to a variety of audiences.	Students will learn to effectively communicate to a variety of audiences, in both written and oral form the following aspects of an earth systems science topic: research question, methods and results, and broader scientific implications.	Participation in a capstone research project and class (Geol A490/Geol A499), culminating in an oral presentation with peer and mentor evaluation;

	Students will learn to conduct effective background research for earth systems project topics and the unique approach to scientific writing, including proper citation and reference format, stylization, and expectations. Students will gain an appreciation of the importance of science communication by involvement in outreach and volunteer activities with the local community	preparation of a research proposal submitted to the geology faculty for evaluation, or to an approved student grant program; reflection and survey following volunteer/outreach activities.

Explain how the proposed program, including all program objectives, will be evaluated, along with plans to track employment. Describe how assessment data will be used.

The department's assessment plan and results for program objectives and student learning outcomes will be reviewed on a three-year rotation by USC AIKEN's Academic Assessment Committee. Within the Department of Biology and Geology at USC AIKEN, an internal Academic Assessment Committee will be formed that reviews the curriculum of the department each year and provides recommendations to the unit head. With the assistance of the committee, the unit head will conduct a comprehensive review of the assessment data each academic year. 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.

Watermark is the repository for assessment reports. Relevant data and reports for this new degree program will be uploaded to and available from Watermark. Continuous improvement to both courses and program will be pursued in response to assessment findings.

Employment of graduates will be tracked through the cooperative efforts of the department, Office of Career Services, and the Alumni Office.

Accreditation and Licensure/Certification

Will the institution seek program-specific accreditation (e.g., CAEP, ABET, NASM, etc.)? If yes, describe the institution's plans to seek accreditation, including the expected timeline.

☐Yes

☒No

Will the proposed program 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

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March 4, 2020

University of South Carolina Aiken
Department of Biology & Geology
University Parkway
Aiken, SC 29801

Dr. Kelly Gibson:

RE: The Earth Systems Science Program (ESSP) at USC Aiken

Pursuant to our conversation of 03/03/2020, please note Savannah River Nuclear Solutions, Environmental Compliance & Area Completions Project (EC&ACP) continuing interest in students engaged in the Earth System Science Program (ESSP) at the University of South Carolina Aiken campus.

At the Savannah River Site (SRS), there are multiple groups of engineers and scientists working together to solve complex environmental issues pertaining to decades of disposal activities associated with the nuclear mission. As you may also be aware, we are experiencing a wealth of knowledge entering the retirement phase. Savannah River Nuclear Solutions has committed to our customer, the Department of Energy, a plan to transfer and develop knowledge through hiring permanent positions across the engineering and science fields.

The ESSP at USC Aiken is of key interest to our employment needs for full time permanent positions, and summer internships. The SRS has and continues to promote student internships as a means for students to gain meaningful experience in the type of work performed at the SRS. Our organization, EC&ACP has supported numerous student internships over the years, with several offers of permanent employment upon graduation.

The ESSP at USC Aiken appears unique in that it is preparing students to be effective contributors in solving complex environmental problems using their training in science, as well as other disciplines such as economics and policy making. This is of key interest to our organization, and we look forward to student interest in both permanent and internship employment at the Savannah River Site.

Sincerely,

Robert S. Van Pelt, Ph.D.
EC&ACP Engineering, Subcontracts Representative
Savannah River Nuclear Solutions
Bldg 730-4B, 3007
Aiken SC 29808
(803) 952-6523 Ph.
Robert.vanpelt@srs.gov

To Whom It May Concern:

I heard that the University of South Carolina-Aiken is pursuing a geology degree program called Earth Systems Science (ESS) and I believe this program would have assisted in my career pursuits. When I began my study at the University of South Carolina- Aiken (USCA), I was still working full-time and taking two classes online and evening classes. I had hoped I would be able to pursue a Bachelor of Science (BS) in Geology with a minor in other science courses, but was told this was not possible and a Geology major could only be attained at the University of South Carolina's main campus in Columbia, one hour and thirty minutes from my residence. Although the major in geology was not available, I took geology classes for a minor and I worked for Dr. Jessica Sullivan as a TA and RA in her Earth Surface Processes lab for two years. In those two years I worked on two research projects for myself and four more as Dr. Sullivan's RA.

Working in Dr. Sullivan's lab allowed me to work with several Geology professors from the Columbia campus during her field research. These research trips studying Geological Processes afforded me the opportunity to form relationships with the possibility of working for one as a GA when I pursue my PhD. I enjoyed my classes in Biology but a major in Geology would have allowed me to focus more on the Geo (Earth) part of my studies which was the reason I left AT&T to become a researcher. I am currently a Graduate student at the Arnold School of Public Health studying Environmental Health Sciences (ENHS). I am pursuing a Master in ENHS classes to attain an overall perspective on the Earth using the knowledge gained in my classes in Geology from USCA and my current environmental courses at the University of South Carolina (U of SC). I believe a program such as Earth System Sciences as a major would have benefited me much more. The diversity of an ESS course program would give future students more choices in their career, whether for business or academia.

Sincerely,

Ronald A. Willis

Graduate Research Assistant- ENHS

Arnold School of Public Health

University of South Carolina