New Program Proposal
Bachelor of Arts / Artium Baccalaureatus in Meteorology
With a Concentration in Operational Meteorology
College of Charleston

Summary

The College of Charleston requests approval to offer a program leading to the Bachelor of Arts and Artium Baccalaureatus (B.A. and A.B.) in Meteorology with a Concentration in Operational Meteorology to be implemented in Fall 2017. The proposed program is to be offered through traditional instruction. The following chart outlines the stages of approval for the proposal; the Advisory Committee on Academic Programs (ACAP) voted to recommend approval of the proposal. The full program proposal is attached.

Stages of Consideration	Date	Comments
Program Proposal Received	1/15/16	Not Applicable
Conference Call	2/11/16	CHE staff asked for an explanation for the designation of the proposed new program as a B.A. in meteorology and not a B.S., given the extensive math and science curriculum requirements. College representatives stated the B.A was preferred because of the mission and history of the College of Charleston as a liberal arts institution. Staff then asked about the designation of the proposed new concentration in Atmospheric Physics under the extant B.S./A.B. in Physics (see Proposal Modification: B.S. Physics, add Atmospheric Physics) given that Atmospheric Physics is a branch of Meteorology as noted in the original Atmospheric Physics modification proposal submitted. College representatives stated that the reason for not adding the Atmospheric Physics concentration to the proposed Meteorology program proposal was because of the large number of Physics courses required for this concentration.
ACAP Consideration	2/18/16	Due to concurrent submissions and curricular similarities for the B.A. in Meteorology proposal and the Atmospheric Physics modification proposal, CHE staff invited ACAP to discuss the proposals jointly, though advising ACAP to consider the proposals for vote separately. The College of Charleston representative discussed the need for the proposed program and explained the rationale for offering it as a B.A. program instead of a B.S. The University of South Carolina representative noted USC considered offering Meteorology in the past but was concerned about retaining qualified faculty. USC invited the College to consider offering the Meteorology degree jointly. In addition, USC also noted the Meteorology curriculum appeared to be more as a B.S. than B.A.

Stages of Consideration	Date	Comments
		Representatives from the College of Charleston thanked USC for the offer to collaborate, but confirmed it will pursue the degree independently. After summarizing the conference call, staff cited one catalog of Meteorology programs offered in the US and Canada that showed programs were predominantly offered as B.S./M.S. degrees instead of B.A./M.A. degrees. In response, representatives noted that there may be as many as 10 Meteorology degrees offered as B.A. instead of B.S. degrees. Staff requested this supporting documentation, and stated a request for revisions to the proposal would be forthcoming. ACAP members voted to approve the program proposal.
Comments and suggestions from CHE staff sent to the institution	2/26/16	Staff requested revisions to the proposal to: • Explain the relationship of the proposed Meteorology program to the proposed Atmospheric Physics concentration and both proposals to the Physics program as well as more detail about program delivery, specifically faculty course load responsibilities and qualifications. • Discuss how the Meteorology concentration was formerly a part of the Physics program and the effect on the Physics program for moving Meteorology to a stand-alone degree program. • Explain the rationale for offering the proposed program as a B.A. instead of a B.S. degree as discussed during the conference call and ACAP meeting. • Confirm the Board of Trustees approval date. • State whether the program meets the stringent curricular requirements of the American Meteorological Society (AMS), or those required by the Federal Civil Service for meteorologist positions within the National Weather Service (NWS). • Explain how "environmental science, insurance, shipping, regulation, science journalism, and secondary science education" are Meteorology-related jobs and how they relate to the positions listed on p. 4. • Explain how the different lists of employment opportunities provided in the proposal are related as well as how the proposed program prepares graduates for the positions listed. • Provide state, regional, and/or local employment data. • Include data about demand and graduation rates from peer institutions. • Explain the gap in graduates and expected employment (the proposal states that only seven graduates are needed each year but 10 are expected; will the other three pursue graduate studies in meteorology or a related field or will they find employment in a related field?). • Provide more information about articulation and whether there have been deliberations about pursuing an agreement with the technical colleges.

Stages of Consideration	Date	Comments
		• Identify some of the related and unrelated fields "graduates of the proposed program could potentially seek graduate study in" at Clemson and USC. • Explain the reasoning for the enrollment projections provided and the ratio of headcount to credit hours. • Provide total credit hours and all course titles and explain how the courses mentioned in the budget justification section will be modified. • Review the new costs identified to verify feasibility to deliver the program. Include faculty and staff salaries according to the total FTE for the proposed program. • Verify the figure shown for tuition funding. • Explain how the program will be assessed using external surveys, accreditation reports and recommendations, and pass rates on the American Meteorological Society certificates, as well as describe how the data will be used. • Identify how many additional courses beyond the program are required for the American Meteorological Society certifications and explain the rationale for excluding those courses for students interested in pursuing positions that require such certifications.
Revised Program Proposal Received	3/10/16	The revised proposal addressed many of the requested revisions, except for providing a catalog of comparable B.A. programs as discussed at the ACAP meeting. Upon review, CHE staff believes the proposed Meteorology curriculum has merit, though clarity is sought how the science and math emphasis in the curriculum supports program objective #2 (p.2): enabling students "to connect concepts in meteorology to broader societal, environmental, political, business or ecological issues." Staff compared the curricula for the proposed Meteorology degree and the proposed Atmospheric Physics concentration under the B.S. in Physics. Though the number of Physics courses required was cited as the reason to offer the Atmospheric Physics concentration as part of the B.S. Physics degree and not the proposed Meteorology program, the curricula for the proposed Atmospheric Physics concentration and for the proposed Meteorology degree appear to include 12 of the same physics courses, in addition to four of the same math courses, and similar general education requirements (see comparison chart). As a result, there appears to be substantial duplication in the coursework between Meteorology and Atmospheric Physics. In addition, the Meteorology curriculum continues to suggest alternative consideration as a Bachelor of Science degree.

Recommendation

The staff recommends that the Committee on Academic Affairs and Licensing commend favorably to the Commission the Meteorology program with a Concentration in Operational Meteorology to be implemented in Fall 2017. However, staff invites the Committee to review with the College the merits of the program as a Bachelor of Science and Artium Baccalaureatus with a second concentration in Atmospheric Physics.

College of Charleston Curricula Comparison Chart

Curriculum Map – B.S. Physics with Atmospheric Physics Concentration

Freshman Fall (15 credits)	Freshman Spring (17 credits)
MATH 120 (Calc I) (4)	MATH 220 (Calc II) (4)
PHYS 111 (General Physics I) (3)	PHYS 112 (General Physics I) (3)
PHYS 111L (General Physics I Lab) (1)	PHYS 112L (General Physics II Lab) (1)
ENGL 110 (Freshman Composition) (4)	HIST 101/103 (3)
FYSM (First Year Seminar) (3)	Language I (3)
	Free Elective (3)
Sophomore Fall (16)	**Sophomore Spring (16)**
PHYS 230 (Modern Physics I) (3)	PHYS 370 (Experimental Physics) (4)
MATH 221 (Calc III) (4)	MATH 323 (Differential Equations (3)
MATH 203 (Linear Algebra) (3)	Elective (off concentration list) (3)
Language II (3)	Language III (3)
HIST 102/104 (3)	Hum/SS I (3)
Junior Fall (15)	**Junior Spring (15)**
PHYS 409 (Electricity and Magnetism) (3)	PHYS 301 (Classical Mechanics) (3)
PHYS 459 (Cloud and Precipitation Physics) (3)	PHYS 405 (Thermodynamics) (3)
Hum/SS II (3)	PHYS 415 (Fluid Mechanics) (3)
Hum/SS III (3)	Elective (off concentration list) (3)
Language IV (3)	Hum/SS IV (3)
Senior Fall (16)	**Senior Spring (12)**
PHYS 403 (Quantum Mechanics I) (3)	PHYS 420 (Senior Research) (3)
PHYS 419 (Research Seminar) (1)	PHYS Elective (3)
Elective (off concentration list) (3)	PHYS Elective (3)
Hum/SS V (3)	Free Elective (3)
Hum/SS VI (3)	
Free Elective (3)	

Total Credit Hours: 122

Curriculum Map – B.A. Meteorology with Operational Meteorology Concentration

Freshman Fall (15 credits)	Freshman Spring (17 credits)
MATH 120 (Calc I) (4)	MATH 220 (Calc II) (4)
PHYS 111 (General Physics I) (3)	PHYS 112 (General Physics I) (3)
PHYS 111L (General Physics I Lab) (1)	PHYS 112L (General Physics II Lab) (1)
ENGL 110 (Freshman Composition) (4)	PHYS 105 (Introduction to Meteorology) (3)
FYSM (First Year Seminar) (3)	HIST 101/103 (3)
	Language I (3)
Sophomore Fall (16)	**Sophomore Spring (15)**
MATH 221 (Calc III) (4)	MATH 323 (Differential Equations) (3)
PHYS 215 (Synoptic Meteor) (3)	PHYS 230 (Modern Physics I) (3)
PHYS 225 (Climate) (3)	Free Elective (3)
HIST 102/104 (3)	Language III (3)
Language II (3)	Hum/SS I (3)
Junior Fall (16)	**Junior Spring (15)**
PHYS 370 (Experimental Physics) (4)	PHYS 301 (Classical Mechanics I) (3)
PHYS 459 (Cloud and Precipitation Physics) (3)	PHYS 405 (Thermodynamics) (3)
Language IV (3)	PHYS 415 (Fluid Mechanics) (3)
Hum/SS II (3)	PHYS 425 Mesoscale Meteorology (3)
Hum/SS III (3)	Hum/SS IV (3)
Senior Fall (16)	**Senior Spring (12)**
PHYS 419 (Research Seminar) (1)	PHYS 420 (Senior Research) (3)
Elective (off concentration list) (3)	Elective (off concentration list) (3)
Free Elective (3)	Free Elective (3)
Free Elective (3)	Free Elective (3)
Hum/SS V (3)	
Hum/SS VI (3)	
Hum/SS VI (3)	

Total Credit Hours: 122

General Education credit hours shared between the two programs: 43/43 (100%)

Core credit hours (Math and Physics Courses) shared between the two programs: 46/55 (84%)

Elective credit hours shared between the two programs: 15/24 (62.5%)

* Note: The Atmospheric Physics curriculum includes six credit hours of Physics electives (see senior year Spring semester) which could be satisfied with the Physics courses required for Meteorology that are not currently required for Atmospheric Physics (PHY 105, 215, 225, and 425). In addition, the Atmospheric Physics curriculum includes nine credit hours of electives from a concentration course list, which includes some of the Physics courses required for Meteorology that are not currently required for Atmospheric Physics (PHY 215, 225, and 425); there are also eight additional courses that appear on both lists of elective courses for the two programs. As a result, it is possible for 24/24 credit hours of the electives to be shared by the two programs.

Total Shared Credit Hours: 104/122 (85%)

** Total shared credit hours using Meteorology courses for the Physics electives for Atmospheric Physics and concentration electives that appear on the list of courses for both programs is 113/122 (93%)

*** If comparing the Atmospheric Physics to the general Meteorology program (i.e., without the Operational Meteorology concentration) as shown on page 14 of the proposal, it is evident that the courses required for Atmospheric Physics could easily fit the curriculum due to the number of free and meteorology electives included in that curriculum.

CAAL
04/07/16
Agenda Item 2d

Name of Institution
College of Charleston

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

B.A. degree in meteorology
A.B. option
Concentration in operational meteorology

A combination BA degree with a concentration in operational meteorology is preferred over a BS degree because it serves both the liberal arts population and also the operational meteorology population, while the BS would only serve the operational meteorology population. A BA degree is also in keeping with the mission of the College of Charleston, a liberal arts institution.

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. 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

A BA degree with a concentration in operational meteorology requires a minimum of 61 hour credit hours in math and science, which is more than many BS degrees.

Proposed Date of Implementation
Fall 2017

CIP Code
40.0404

Delivery Site(s)
College of Charleston Campus

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
Faculty Curriculum Committee, Date: 11/20/15
Faculty Senate Budget Committee, Date: 12/7/15
Faculty Senate, Date: 12/8/15
Faculty Academic Planning Committee, 1/12/16
Board of Trustees, Date: 1/28/16

Background Information

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

No full degree program in meteorology exists in South Carolina, and no programs meet the stringent curricular requirements of the American Meteorological Society (AMS), or those required by the Federal Civil Service for meteorologist positions within the National Weather Service (NWS). This new B.A. degree is intended for students interested in double majors outside the sciences, and for students desiring one of many meteorology-related jobs such as meteorological consulting for private and public sector industries (such as aviation, shipping and sea fishing, public policy, and insurance), broadcast meteorology (which includes science journalism), environmental science technical work, and secondary science education. The concentration in operational meteorology, combined with the B.A., is intended to prepare students for careers in operational meteorology (which includes forecasting and numerical weather prediction). The BA with this concentration is specifically designed to meet the stringent curricular requirements of the AMS and NWS. The curriculum was designed in consultation with AMS staff. Atmospheric physics is an interdisciplinary area between meteorology and physics. Given the high number of required physics courses, an atmospheric physics concentration is most effectively mated to the BS in physics, not the BA in meteorology.

Students in this major will take 16 hours of physics and math courses during their first year, will go on to take 17 additional hours of meteorology courses, and will choose electives from astronomy, chemistry, biology, geology, math, environmental studies, English, and communications. The optional operational meteorology concentration requires an additional 34 hours of meteorology, physics, math and elective courses for students interested in forecasting. This multidisciplinary approach meets the curricular requirements of the AMS and is compatible with the liberal arts mission of the College. The cost of these programs is minimal as most courses already exist and no new faculty or facilities are needed.

List the program objectives. (2000 characters)

South Carolina has no full undergraduate degree program devoted to the study of meteorology. Therefore, the primary goal of this program is to provide a strong background in meteorology that will prepare students for many possible meteorology-related careers. When students complete the BA degree, they will be able to

1) Demonstrate an understanding of the fundamental principles of meteorology, which includes climate and either synoptic meteorology or air pollution;
2) Demonstrate an ability to connect concepts in meteorology to broader societal, environmental, political, business, or ecological issues;
3) Demonstrate proficiency in designing, conducting, and reporting results from experiments relative to topics in meteorology;
4) Synthesize core knowledge and analytical tools to design a research project relevant to meteorology;
5) Demonstrate the ability to communicate meteorological information effectively in written and oral form.

An Operational Meteorology concentration is also proposed for students who are specifically interested in pursuing forecasting and operational meteorology as a career. The operational meteorology concentration is specifically designed to meet the requirements for future employment in the NWS or in broadcast meteorology. In addition to the program objectives for the BA degree, students who complete the Operational Meteorology concentration will be able to

1) Explain the physical laws governing the structure and evolution of atmospheric phenomena spanning a broad range of spatial and temporal scales.
2) Demonstrate proficiency in interpreting various meteorological diagrams and synthesize information from various meteorological sources to diagnose synoptic and mesoscale weather phenomena.
3) Demonstrate proficiency in using computer based weather visualization and analysis packages.

4) Demonstrate skill in developing, evaluating, and disseminating short-to-medium term forecasts of synoptic and mesoscale weather phenomena.

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)

The U.S. Bureau of Labor Statistics (BLS) estimates that the U.S. employs a total of 11,100 atmospheric scientists/meteorologists. If South Carolina contributes a representative fraction (about 1.5% of the U.S. population), this suggests between 150-200 people working as atmospheric scientists/meteorologists in the state right now, all of whom had to be trained in other states. The proposed program also trains graduates for other types of careers such as meteorology research, national defense (particularly air force), insurance, airlines, sailing, shipping, farming, Wall street, government policy and regulation, law, environmental assessment, and satellite remote sensing.

According to the BLS, atmospheric scientist employment will increase about 10% from 2012 to 2022, with the largest expected changes in computer systems design and related services (34.7% increase) and scientific and technical consulting services (40.8% increase). Another common path for our students would be environmental science work. According to BLS, environmental scientist employment will increase approximately 15% from 2012 to 2022, with the largest expected change in scientific and technical consulting services (40.8% increase).

Based on demand from our students and graduation rates from peer institutions nationwide that have meteorology programs (Historical averages: UNC-Asheville, 12/year, Kean, 6/year, Lyndon State College, 13/year, Plymouth State, 8/year, Northland College, 11/year, Metro. St. College Denver, 8/year), we anticipate ten graduates from our program per year, which should cover most of the need for meteorologists in S.C. Our program could actually be more productive considering that our degree programs are more broad based, and that there is no competing program within the state (unlike some of the peers listed above). Indeed, the southeastern U.S. has few meteorology programs, which will enhance our recruiting. About 600 bachelors degrees in meteorology from full-fledged meteorology programs were awarded annually nationwide on average over the past decade. Prorating for population, this again suggests about ten graduates for the state of South Carolina, if a full-fledged program existed. Almost three students per year have graduated from the College with a concentration in meteorology and another two to three students per year have graduated with the minor in meteorology since they were approved in 2000. Surveys taken of meteorology concentrations and minors indicate most would pursue the proposed BA degree were one to exist. In addition, high school students who regularly inquire about a meteorology program can now be told that we have one that will meet AMS and federal civil service requirements. Many other students don't even bother to request information, as they already know our program does not meet these requirements.

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."

Employment Opportunities			
Occupation	**Expected Number of Jobs**	**Employment Projection**	**Data Source**
Atmospheric scientists/meteorologists	11,100	10% from 2012 to 2022	Bureau of Labor statistics
Environmental scientists and specialists	90,000	15% from 2012 to 2022	Bureau of Labor statistics
Environmental science and protection technicians	32,800	19% from 2012 to 2022	Bureau of Labor statistics
Atmospheric Science postsecondary teachers	10,930	10% from 2012 to 2022	Bureau of Labor Statistics

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

Since there are no programs for operational meteorology (OM) in S.C., it is expected that successful students in OM will have greater opportunities for employment within S.C. Currently, 57 OMs are currently employed at NWS offices within S.C., 64 are currently employed at TV and radio stations within S.C., 28 OMs are currently employed at the state climatology office and the Savannah River Site, and 23 OMs are currently employed at S.C. airports and air force bases. These numbers come either from conversations with staff at these stations or agencies, or were gleaned from their websites. Furthermore, dozens more are currently employed by S.C. industrial concerns and businesses. Currently, S.C. residents who desire any of these jobs must receive their education outside of S.C. In summary, there are over 200 OMs employed in the state today. Assuming a career lifetime of about 30 years would mean that about 7 OMs retire on average each year and would be replaced by 7 graduates from our program each year. It is expected that the remaining 3 per year will pursue graduate studies in meteorology or find employment in a related field.

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.

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)

The new courses created may serve as allowable electives within several existing programs at the institution (Physics B.S., Physics B.A., Energy Production Concentration, Astronomy B.A., Minors in Astronomy and Environmental Studies, and the Physics Cognate of the Data Science Degree). There also will be some (modest) impact on enrollment in existing courses, due to the fact that this newly served student population will be required to take existing courses to complete the degree program.

The Meteorology BA is designed for both future forecasters/meteorologists and the more diverse liberal arts student base that may be double majoring with another (potentially non-quantitative) field. The extra concentration in operational meteorology is specifically designed for those meteorology students who desire to obtain sufficient quantitative training to compete for federal civil servant-level forecasting jobs or desire to pursue advanced study in Meteorology or Atmospheric Science.

Conversely, the Atmospheric Physics concentration attached to the Physics BS degree is designed for very strong, quantitatively aligned students who seek a full Physics degree with a targeted elective sequence for specialization within the atmospheric sciences. This student population is more likely to go on to graduate school in Physics (including Atmospheric Physics), Atmospheric Science, Climate Science, Atmospheric Chemistry, or other related fields.

The faculty teaching the courses within the Meteorology BA degree program will be predominantly from the Meteorology and Atmospheric Physics group in the College of Charleston's Physics department (Lindner, Larsen, Williams and Rumsey). All have relevant training and research interests to serve both audiences (degrees in both areas, research interests in both areas).

Confusion on these programs partially stems from the fact that the Physics department is retiring their concentration in Meteorology that was linked to the B.S. degree. This old "Meteorology Concentration" attached to the Physics BS was poorly named; the nature of the retired concentration was much closer to the newly proposed Atmospheric Physics concentration than to the new Meteorology BA, despite the same name.

The students served by the newly proposed BA program here previously did not have an appropriate avenue to obtain sufficient training for a job in forecasting and, consequently, were often leaving the state. Also, many liberal arts students had difficulty with the additional math and physics requirements for the BA in physics with concentration in meteorology, and would thus be better suited to the BA in meteorology.

There should be an overall positive effect on the physics program by creating this standalone meteorology program. Upper-level physics courses are typically underpopulated, and by allowing these classes to serve both the physics and meteorology audiences will enhance enrollment. This will also create additional interdisciplinary curriculum opportunities for physics majors. All programs will be housed in the physics and astronomy department.

List of Similar Programs in South Carolina

Program Name	Institution	Similarities	Differences
No full meteorology programs exist in SC, but some related programs offer a few of the courses			
Applied Physics Major with Concentration in Environmental Physics	Coastal Carolina University	Involves coursework associated with the quantitative physical sciences related to fluids, remote sensing, and atmospheric physics. Includes some of the same introductory/intermediate coursework.	Isn't designed as a meteorology program; doesn't meet AMS or NWS requirements; doesn't include forecasting, synoptic, dynamic, or climate courses; requires more physics than this program. Designed for very different population.
Environmental Science B.S.	University of South Carolina	Involves some coursework associated with introductory physics coupled with natural science coursework in the environmental sciences.	Not aimed at students seeking careers in meteorology. This is a much broader program that still will not meet the minimal AMS or NWS requirements for programs in meteorology.
Geography B.S.	University of South Carolina	Offers some courses in meteorology and climatology and a meteorology/climatology emphasis within the degree program	Strong in climatology, but lacking physical and dynamical meteorology and many other courses needed to meet the minimal AMS or NWS requirements for programs in meteorology. Program is also broader than traditional meteorology degree program.
Geology B.S. with Environmental Science Concentration	Clemson University	Closest program at Clemson to what is proposed here; involves study of Earth system as a whole, includes some environmental science classes, which may include some elements of atmospheric science.	Much more pronounced focus on Earth history and standard Geological topics. No required coursework in atmospheric science. No path through the program that meets NWS or AMS requirements for programs in Meteorology.
Environmental Studies Major	Wofford College	Program includes some elements of Natural Science investigation to elements of Earth science.	Program not targeted to atmospheric science. Designed to be a blend of Social Science, Humanities, and Science courses within the Environmental designation. Doesn't meet NWS or AMS requirements for Meteorology.

Description of the Program

Projected Enrollment						
Year	Fall		Spring		Summer	
	Headcount	Credit Hours	Headcount	Credit Hours	Headcount	Credit Hours
2016-2017	10	150	15	225	2	6
2017-2018	25	375	27	405	5	15
2018-2019	37	555	38	570	7	21
2019-2020	45	675	46	690	8	24
2020-2021	50	750	50	750	9	27

Three separate methods of estimating demand (detailed below) all lead to a conclusion that by the fourth year the proposed program will graduate approximately ten students per year. The physics and astronomy department currently graduates approximately fifteen students per year, making it one of the most successful undergraduate-only departments in the nation (http://www.aip.org/statistics/trends/highlite/ed/table6.htm). This new degree is very different from what we currently offer and thus will not poach from existing majors but instead attract totally new students. Thus, this new degree program will significantly increase the productivity of an already productive department.

1) Approximately ten graduates per year could be expected if our program is as productive as many of our peer institutions that have meteorology programs (Historical averages: UNC-Asheville, 12/year, Kean, 6/year, Lyndon State College, 13/year, Plymouth State, 8/year, Northland College, 11/year, Metro. St. College Denver, 8/year). Our program could actually be more productive considering that our degree programs are more broad based, and that there is no competing program within the state (unlike some of the peers listed above). Indeed, the southeastern U.S. has few meteorology programs, which will enhance our recruiting.

2) About 600 bachelors degrees in meteorology from full-fledged meteorology programs were awarded annually nationwide on average over the past decade. Prorating for population, this again suggests about ten graduates for the state of South Carolina, if a full-fledged program existed.

3) Almost three students per year have graduated from the College with a concentration in meteorology and another two to three students per year have graduated with the minor in meteorology since they were approved in 2000. Surveys taken of meteorology concentrations and minors indicate most would pursue the proposed BA degree were one to exist. However, for every ten high school students who request information about our program, less than one actually enrolls. A much higher percentage of these high school inquiries will likely enroll in a full degree program that meets AMS and federal civil service requirements. Many other students don't even bother to request information, as they already know our program does not meet these requirements. It is hard to estimate, but it seems reasonable to assume that there would have been ten graduates if those requirements were met.

Although it may appear logistically daunting at first, it is actually not difficult to recruit a couple dozen prospective meteorology students from the five hundred high schools in SC. Currently, prospective meteorology students determine which university to attend by perusing the AMS curriculum guide (a compendium of all the meteorology programs in the country), using Internet search engines to gather information, or getting advice from staff at the local NWS offices, from local TV broadcast meteorologists, or from guidance counselors. Primarily because the college does not have a program that meets federal civil service requirements, none of these sources currently cast a favorable light on our program, instead encouraging students to attend out of state schools. Once our proposed program is approved, we intend to quickly change the information prospective students receive. The AMS curriculum guide will be updated. We will personally contact all NWS staff and all TV broadcast meteorologists within the state, showing them the robustness of our new program. Announcements of the new program will be sent to all guidance counselors, and advertisements will be sent with college admissions representatives as they travel throughout the state. Finally, we will design a detailed web page, using the latest search engine optimization routines to draw the attention of prospective students. The sum of all these recruiting strategies should pull in the required prospective students to meet our expectation for graduation rates.

Using the above estimate of ten graduates per year, and assuming a conservative attrition rate, we estimate the program will have approximately 50 students in residence once fully operational (and that it would take five years to ramp up to that number). All students are assumed to be enrolled in 15 hours during fall and spring, and 3 hours during the summer.

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)

Are there any special articulation agreements for the proposed program?

☐Yes

☒No

If yes, identify. (1000 characters)

Students from two-year institutions could take the one year of calculus and one year of basic physics courses required for this proposed degree as well as some of the elective courses at their institution (most two year institutions offer all these courses). Upon transferring to the College of Charleston, those students could take the remaining core courses, and conceivably graduate in four years. Also, graduates of the proposed program could potentially seek graduate study in related or unrelated fields at Clemson or USC.

Transferring into the program from a technical college would not be difficult. If the appropriate courses were taken in a technical college, a four year graduation with a BA in meteorology is quite feasible. Articulation agreements with technical colleges have not been pursued but are possible.

Based on the nature of the curricula in the listed programs, as well as the training that students in the proposed BA Meteorology with Operational Meteorology Concentration will receive, we believe the following in-state graduate programs may be a good fit for our future graduates:

Clemson:
Civil Engineering (MS, Ph.D., and Cert)
Environmental Engineering and Science (MS and PhD)
Hydrogeology (MS)
Secondary Education Math Science (MAT)
Physics (MS, PhD) (esp. Atmospheric and Space Physics Group)
Policy Studies (PhD)

USC:
Civil Engineering (ME, MS, and PhD)
Earth and Environmental Resources Management (MS)
Environmental Health Sciences (MPH, MS, and PhD)
Geography (MA, MS, and PhD)
Geological Sciences (MS and PhD)
Sciences (MAT)

Curriculum

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

Curriculum by Year (B.A. Meteorology)					
Course Name	**Credit Hours**	**Course Name**	**Credit Hours**	**Course Name**	**Credit Hours**
Year 1					
Fall		**Spring**		**Summer**	
MATH 120 (Calc I)	4	MATH 220 (Calc II)	4		
PHYS 111 (General Physics I)	3	PHYS 112 (General Physics I)	3		
PHYS 111L (General Physics I Lab)	1	PHYS 112L (General Physics II Lab)	1		
ENGL 110 (Freshman Composition)	4	PHYS 105 (Intro to Meteor)	3		
FYSM (First Year Seminar)	3	HIST 101/103	3		
		Language I	3		
Total Semester Hours	15	Total Semester Hours	17	Total Semester Hours	
Year 2					
Fall		**Spring**		**Summer**	
PHYS 210 (Intro to Air Pollution) **or** PHYS 215 (Synoptic Meteor)	3	Free Elective	3		
PHYS 225 (Climate)	3	Free Elective	3		
HIST 102/104	3	Free Elective	4		
Language II	3	Language III	3		
Hum/SS I	3	Hum/SS II	3		
Total Semester Hours	15	Total Semester Hours	16	Total Semester Hours	
Year 3					
Fall		**Spring**		**Summer**	
PHYS 370 (Experimental Physics)	4	Free Elective	3		
Free Elective	3	Free Elective	3		
Free Elective	3	Free Elective	3		
Language IV	3	Free Elective	3		
Hum/SS III	3	Hum/SS IV	3		
Total Semester Hours	16	Total Semester Hours	16	Total Semester Hours	
Year 4					
Fall		**Spring**		**Summer**	

Curriculum by Year (B.A. Meteorology)					
Course Name	**Credit Hours**	**Course Name**	**Credit Hours**	**Course Name**	**Credit Hours**
PHYS 419 (Research Seminar)	1				
Meteorology Elective	3	PHYS 420 (Senior Research)	3		
Free Elective	3	Meteorology Elective	3		
Free Elective	3	Free Elective	3		
Hum/SS V	3	Free Elective	3		
Hum/SS VI	3				
Total Semester Hours	15	Total Semester Hours	12	Total Semester Hours	
Year 5					
Fall		**Spring**		**Summer**	
Total Semester Hours		Total Semester Hours		Total Semester Hours	

Curriculum by Year (B.A. Meteorology w/ operational meteorology concentration)					
Course Name	**Credit Hours**	**Course Name**	**Credit Hours**	**Course Name**	**Credit Hours**
Year 1					
Fall		**Spring**		**Summer**	
MATH 120 (Calc I)	4	MATH 220 (Calc II)	4		
PHYS 111 (General Physics I)	3	PHYS 112 (General Physics I)	3		
PHYS 111L (General Physics I Lab)	1	PHYS 112L (General Physics II Lab)	1		
ENGL 110 (Freshman Composition)	4	PHYS 105 (Intro to Meteor)	3		
FYSM (First Year Seminar)	3	HIST 101/103	3		
		Language I	3		
Total Semester Hours	15	Total Semester Hours	17	Total Semester Hours	
Year 2					
Fall		**Spring**		**Summer**	

Curriculum by Year (B.A. Meteorology w/ operational meteorology concentration)					
Course Name	**Credit Hours**	**Course Name**	**Credit Hours**	**Course Name**	**Credit Hours**
MATH 221 (Calc III)	4	MATH 323 (Differential Equations)	3		
PHYS 215 (Synoptic Meteor)	3	PHYS 230 (Modern Physics I)	3		
PHYS 225 (Climate)	3	Free Elective	4		
HIST 102/104	3	Language III	3		
Language II	3	Hum/SS I	3		
Total Semester Hours	16	Total Semester Hours	15	Total Semester Hours	
Year 3					
Fall		**Spring**		**Summer**	
PHYS 370 (Experimental Physics)	4	PHYS 301 (Classical Mechanics I) (3)	3		
PHYS 459 (Cloud and Precipitation Physics)	3	PHYS 405 (Thermodynamics) (3)	3		
Language IV	3	PHYS 415 (Fluid Mechanics) (3)	3		
Hum/SS III	3	PHYS 425 Mesoscale Meteorology (3)	3		
Hum/SS III	3	Hum/SS IV	3		
Total Semester Hours	16	Total Semester Hours	15	Total Semester Hours	
Year 4					
Fall		**Spring**		**Summer**	
PHYS 419 (Research Seminar)	1	PHYS 420 (Senior Research)	3		
Elective (off concentration list)	3	Meteorology Elective	3		
Free Elective	3	Free Elective	3		
Free Elective	3	Free Elective	3		
Hum/SS V	3				
Hum/SS VI	3				
Total Semester Hours	15	Total Semester Hours	12	Total Semester Hours	
Year 5					
Fall		**Spring**		**Summer**	

Curriculum by Year (B.A. Meteorology w/ operational meteorology concentration)					
Course Name	**Credit Hours**	**Course Name**	**Credit Hours**	**Course Name**	**Credit Hours**
Total Semester Hours		Total Semester Hours		Total Semester Hours	

Curriculum by Category*							
B.A. in Meteorology Required Courses	**17+ hours**	**Required Math**	**8+ hours**	**Electives (Cont'd).**	**5+ hours**	**Concentration Elective Courses**	**6 hours**
**********	********	MATH 120 (Introductory Calc)	4	PHYS 298 (Special Topics)	1-3	PHYS 409 (Electricity and Magnetism)	3
Base Experience	*3 or 9 hours*	AND 1 OF EITHER		PHYS 301 (Classical Mechanics)	3	PHYS 340 (Photonics)	3
PHYS 105 (Intro to Meteorology)	3	MATH 220 (Calc II)	4	PHYS 320 (Electronics)	3	BIOL 342 (Oceanography)	3
OR 3 of the Following		OR		PHYS 340 (Photonics)	3	CHEM 111/111L (Principles of Chemistry)	4
GEOL 438 (Hydrogeology)	3	MATH 229 (Vector Calc w/ Chemical Applications)	4	PHYS 350 (Energy Production)	4	CSCI 220/220L (Computer Programming)	4
PHYS 405 (Thermal Physics)	3	**********	********	PHYS 381 (Internship)	1-3	GEOL 438 (Hydrogeology)	3
PHYS 415 (Fluid Mechanics)	3	**Electives**	**5+ hours**	PHYS 390 (Research)	1-3	MATH 250 (Statistical Methods)	3
PHYS 459 (Cloud and Precipitation Physics)	3	ASTR 129/129L (Intro to Astronomy)	4	PHYS 394/394L (Digital Signal and Image Processing w/ Biomedical Applications)	4		
**********	********	ASTR 306 (Planetary Astronomy)	3	PHYS 399 (tutorial)	3		
Emphasis Experience	*3 hours*	BIOL 204 (Man and the Environment)	3	PHYS 405 (Thermal Physics)	3		
PHYS 210 (Intro. to Air Pollution)	3	BIOL 342 (Oceanography)	3	PHYS 409 (Electricity and Magnetism)	3		
OR		CHEM 101/101L (General Chemistry)	4	PHYS 410 (Electricity and Magnetism II)	3		

PHYS 215 (Synoptic Meteor.)	3	CHEM 111/111L (Principles of Chemistry)	4	PHYS 412 (Special Topics)	1-3		
**********	********	CHEM 112/112L (Principles of Chemistry)	4	PHYS 415 (Fluid Mechanics)	3		
PHYS 225 (Climate)	*3*	COMM 104 (Public Speaking)	3	PHYS 425 (Mesoscale Meteorology)	3		
PHYS 370 (Experimental Physics)	*4*	CSCI 220/220L (Computer Programming)	4	PHYS 457 (Satellite Meteorology)	3		
PHYS 419 (Research Seminar)	*1*	ENGL 334 (Technical Writing)	3	PHYS 459 (Cloud and Precipitation Physics)	3		
**********	********	ENVT 200 (Introduction to Environmental Studies)	3	**********	**********		
Capstone Experience	*3 or 6 hours*	ENVT 395 (Seminar)	1	**Concentration required courses**	**28 hours**		
PHYS 420 (Senior Research)	3	GEOL 213 (Natural Hazards)	3	PHYS 215 (Synoptic Meteor.)	3		
OR		GEOL 288 (Global Change)	3	PHYS 230 (Modern Physics)	3		
PHYS 499 (Bachelor's Essay)	6	GEOL291 (Water Resources)	3	PHYS 301 (Classical Mechanics)	3		
**********	********	GEOL 438 (Hydrogeology)	3	PHYS 405 (Thermal Physics)	3		
Introductory Physics	*8 hours*	GEOL 442 (Remote Sensing)	4	PHYS 415 (Fluid Mechanics)	3		
PHYS 111/111L/112/112L (General Physics)	8	HONS 390 (Special Topics)	3-6	PHYS 425 (Mesoscale Meteorology)	3		
OR		MATH 250 (Statistical Methods)	3	PHYS 459 (Cloud and Precipitation Physics)	3		
HONS 157/157L/158/158L (Honors Physics)	8	PHYS 106L (Exercises in Weather and Climate)	2	MATH 221 (Calc III)	4		
OR		PHYS 210 (Intro to Air Pollution) or PHYS 215 (Synoptic Meteor.)	3	MATH 323 (Differential Equations) or PHYS272 (Methods of Applied Physics)	3		

PHYS 101/101L/102/102L (Introductory Physics) (grade req of C- or better in each course)	8	PHYS 230 (Modern Physics)	3				

* Add category titles to the table (e.g., major, core, general education, concentration, electives, etc.)

Total Credit Hours Required: 122 with 38+ for BA; 61+ for BA and concentration in operational meteorology, plus additional credit hours for general education coursework and miscellaneous electives to total 122.

Course Descriptions for New Courses

Course Name	Description
PHYS 106L (Exercises in Weather and Climate)	Exercises for important topics in meteorology, including clouds, forecasting, thunderstorms, tornadoes, hurricanes and climate change. Concepts will be learned primarily in group-based exercises, supplemented with recorded lecture to provide needed background. Course is intended to be taught in an online format.
PHYS 210 (Introduction to Air Pollution)**	Sources of air pollution, and the influence of anthropogenic and natural processes on air quality. Topics include the atmosphere's chemical composition, atmospheric chemical reactions, greenhouse gases, global warming and the roles of government in air pollution control.
PHYS 215 (Synoptic Meteorology)	Application of physical principles to synoptic-scale weather analysis and forecasting. Topics include weather observing techniques and weather map analysis; analysis of cyclones, fronts, and jets; temperature and precipitation forecasting techniques; and analysis of soundings and thermodynamic diagrams.
PHYS 225 (Climate)**	This course serves as an introduction to the study of Earth's climate. Topics may include global energy balance, atmospheric radiative transfer, the hydrologic cycle, environmental energy transport, climate sensitivity, and feedback mechanisms. Lecture three hours per week.
PHYS 425 (Mesoscale Meteorology)	Applications of dynamics and forecasting techniques in diagnosing the organization of mesoscale and convective phenomena. Topics include mesoscale instabilities; boundary layer dynamics; air mass boundaries; convective initiation; convective storms; mesoscale convective systems; tornadoes; flash flooding; and various orographic mesoscale phenomena.
PHYS 459 (Cloud and Precipitation Physics)**	Essential elements of the physics associated with the study of clouds and precipitation. Lectures three hours per week.
**Note: PHYS 210, 225 and 459 replace existing courses PHYS 456, 458 and 308, respectively	

Faculty

The department of Physics and Astronomy already includes 4 faculty members (Drs. Lindner, Larsen, Rumsey, and Williams) who have an educational background in various subfields within Meteorology and Atmospheric Physics. These faculty already exist in the department (i) because the department offers a concentration in meteorology which contained many of the courses included in this proposal, and (ii) because the department has participated in the Masters in Environmental Studies Program since its inception in 1994.

Some concerns have been raised about whether 4 faculty specifically trained in atmospheric science are sufficient to meet the instructional needs of this program. We believe that these 4 faculty are sufficient to staff the programs for the following reasons:

1. Because of the design of this program, much of the core and elective instruction can and will be done by faculty that do not have specific Meteorological training. General/Introductory Physics and upper level physics fulfill required elements of federal civil service jobs and the proposed curricula, yet are frequently taught by non-Atmospheric faculty. As such, the department is able to leverage the existence of non-Atmospheric faculty that are capable of teaching within this program, without adding to their current instructional load. We already teach these courses to our Physics majors, quite frequently without utilizing the contact hours available among the 4 Atmospheric faculty.
2. We are not the only program that would be attempting to run a program like this with 5 or fewer faculty. As evidence, we checked the UCAR affiliate list for Meteorology programs.
   UCAR (the University Corporation for Atmospheric Research) has 109 current members (including the College of Charleston since 1993), and requires a clear demonstration of programmatic relevance to Atmospheric Science. This consortium's membership list is widely respected and comprises many of the top Atmospheric Science and Meteorology Program in the country.

   Listed among UCAR's members are the following programs that run full undergraduate Meteorology programs with 5 or fewer Atmospheric faculty (sometimes without the advantages that we list under bullet item (1) above):
   - Central Michigan University (3 faculty)
   - Metropolitan State University of Denver (3 faculty)
   - University of Northern Colorado (3 faculty)
   - Western Illinois (3 faculty)
   - SUNY-Oswego (4 faculty)
   - St. Cloud State (4 faculty)
   - University of North Carolina at Asheville (4 faculty)
   - SUNY-Brockport (5 faculty)
   - Millersville (5 faculty)

Due to both of these considerations – and combined with the fact that we have been running a successful concentration in a closely related topic area for decades already -- we feel confident that we have the necessary personnel resources in place to offer an excellent program.

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)**
B. Lee Lindner Associate Professor	Full time	PHYS 105, Introduction to meteorology, 3, spring PHYS 106L, Exercises in weather and climate, 2, summer PHYS 457, Satellite Meteorology, 3, biennial	Ph.D., Astrophysical, Atmospheric and Planetary Sciences, Univ. Colorado, Dissertation "Aeronomy and Radiative Transfer of the Atmosphere"	Primary program contact; no change in assignments; has taught 105 and 457 six times each already and 106L twice as a special topics course
Gabriel Williams Assistant Professor	Full time	PHYS 215, Synoptic meteorology, 3, biennial PHYS 425, Mesoscale meteorology, 3, biennial PHYS 405,ThermalPhysics,3,fall	Ph.D., Atmospheric Science, Colorado State Univ., Dissertation "Effects of environmental flow on internal dynamics of tropical cyclones"	Primary operational meteorology contact; has taught 405; has also taught 215 as a special topics course; 425 will cause a small change in assignment
Mike Larsen Associate Professor	Full time	PHYS 225, Climate, 3, biennial PHYS 415, Fluid Dynamics, 3, biennial PHYS 459, Cloud and Precipitation Physics, 3, biennial	Ph.D., Physics, Michigan Tech. Univ., Dissertation "Studies of discrete fluctuations in atmospheric phenomena"	Primary atmospheric physics contact; has taught 459 in its previous form as 308
Ian Rumsey Assistant Professor	Full time	PHYS 210, Introduction to Air Pollution, 3, biennial	Ph.D., Atmospheric Science, North Carolina State Univ., Dissertation "Sulfur emissions from swine feeding"	Primary environmental/air pollution contact; has taught 210 as a special topics course
Jeff Wragg Instructor	Full time	PHYS 370, Experimental Physics, 4, every term	Ph.D., Physics, Univ. of Missouri	Has taught 370 every year for a decade
All 18 faculty members of the department	Full time	PHYS419, Research Seminar, 1, every term PHYS420, Senior Research, 3, every term PHYS499, Bachelors Essay, 6, every term PHYS101/102/111/112, intro physics, 4, every term	Ph.D., Physics or Astrophysics or Atmospheric Physics	All courses are currently taught and have been taught for 20 years; 419/420/499 are all specific to the research of the faculty member

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

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
0.8	0.1	0.04

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)

No new faculty will be required as the department currently has four tenure-track meteorologists. There are 6 new courses proposed for this program, totaling 15 hours, plus 2 hours in summer. 3 existing courses are discontinued, totaling 11 hours. Thus, only 4 hours are added, on a biennial basis (1 hour per semester). This will require one roster faculty member to teach one course every 3 semesters. Existing courses will easily absorb the additional meteorology students as all physics classes underutilize classroom space (thus no new sections are needed).

The department chair will assume the minor administrative duties. The only support personnel needed are lab managers; two already exist within the department and would assume the minor items needed for these courses. Additional clerical needs associated with the program are provided by student assistants, therefore there is a small expense for additional hours for the student assistant.

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)

No new library resources are anticipated for this program. The only resources required are access to the scientific journals listed below, notably those of the American Geophysical Union (AGU) and American Meteorological Society (AMS). All of the required resources are currently available in the library; thus no new expense.

AGU: Geochem.Geophys.Geosyst., Geophys.Res.Lett., J.Adv.Model.Earth Sy., J.Geophys.Res., Rev.Geophys., Water Resour.Res., Nonlinear Proc.Geoph.,

AMS: Earth Interact., Bull.Am.Meteorol.Soc., J.Applied Meteorol.Climatol., J.Atmos.Oceanic Tech., J.Climate, J.Hydrometeorol., J.Phys.Oceanogr., J.Atmos.Sci., Mon.Weather Rev., Weather Forecast., Weather Clim.Soc.

Additional Journals (Various Publishers): Aerosol Sci.Tech., J.Aerosol Sci., J.Quant.Spectrosc.Ra., Q.J.Roy.Meteorol.Soc., J.Phys.Chem., Atmos.Res., Environ.Poll., Atmos.Chem.Phys., Environ.Res.Lett., J.Hydrol., J.Opt.Soc.Am., J.FluidMech., App.Opt., IEEE T.Geosci.Remote , Atmos.Environ., Environ.Sci.Tech.

Student Support Services

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

No graduate assistants are needed for the proposed program. Minor additional clerical support is needed to handle the paperwork associated with the program, which requires additional hours for student assistants. The estimated costs associated with the support are $900 over 5 years. The program would also utilize existing college academic support services such as the college skills lab, advising, counseling, snap, academic experience, etc., but no new resources would be required.

Physical Resources

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

There is no new instructional equipment needed for the proposed program. The physics and astronomy department currently has all the instructional equipment that would be required for the courses in the proposed program.

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

☐Yes

☒No

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)

No new classroom or lab space is required for this program. All normally utilized Physics classrooms should be suitable for all new courses in this major. Some of the courses in the program (e.g. Climate, Experimental Physics, Synoptic Meteorology) are best taught in classrooms with lab or computational equipment, but our standard Physics classrooms have those facilities already.

The only formal lab space that will be required for this program is the upper division undergraduate lab class space (e.g. the space utilized for PHYS 370/Experimental Physics – which already exists) and faculty research labs, which already exist.

No extra modifications of existing facilities should be necessary.

Financial Support

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

Estimated New Costs by Year						
Category	**1st**	**2nd**	**3rd**	**4th**	**5th**	**Total**
Program Administration	0	0	0	0	0	0
Faculty and Staff Salaries*	7821	7821	7821	7821	7821	39105
Graduate Assistants	0	0	0	0	0	0
Equipment	50	150	200	200	200	800
Facilities	0	0	0	0	0	0
Supplies and Materials	100	100	100	100	100	500
Library Resources	0	0	0	0	0	0
Other	200	300	300	300	300	1400
Total	8171	8371	8421	8421	8421	41805
Sources of Financing						
Category	**1st**	**2nd**	**3rd**	**4th**	**5th**	**Total**
Tuition Funding**	98064	439926	632876	764082	841262	2776210
Program-Specific Fees	0	0	0	0	0	0
State Funding (i.e., Special State Appropriation)	0	0	0	0	0	0
Reallocation of Existing Funds	0	0	0	0	0	0
Federal Funding	0	0	0	0	0	0
Other Funding	0	0	0	0	0	0
Total	98064	439926	632876	764082	841262	2776210
Net Total (i.e., Sources of Financing Minus Estimated New Costs)	88827	430489	623389	754595	831775	2729075

*Faculty/Staff salaries are based on $71,100 (the average salary of program faculty) + 32% fringe. Since the program nets only one new course every 3 semesters, the figure reflects 1/12 of the average salary of a program faculty member.
**Calculation of Estimated FTE Revenue ($454 per credit hour for in-state students is used to calculate revenue from students taking courses in the major. Calculations are based on this table:)

	Headcount	Core Hours That Need to Be Taught	Student Credit Hours Generated
2016-2017	27	8	216
2017-2018	57	17	969
2018-2019	82	17	1394
2019-2020	99	17	1683
2020-2021	109	17	1853

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.

Most of the courses in the proposed program would utilize many existing physics courses that will be modified slightly to serve both the physics students and the meteorology students (as there is significant overlap in many concepts). The course descriptions to PHYS 370 (Experimental Physics), PHYS 405 (Thermal Physics), and PHYS 415 (Fluid Mechanics) will be modified slightly so that they are better aligned with the published requirements for meteorologists in the federal civil service. These revisions do not constitute a substantial change to the nature or content of these courses (90%+ of each of the courses remain unchanged, and all usual instructors of these courses have approved the minor necessary changes). These courses must be taught for the physics audience, regardless of whether the B.A. in Meteorology exists. We only expect ten B.A. in Meteorology graduates per year, and this number of students can join the existing classes as they rarely get close to the room size; no new sections are needed. Also, three new meteorology courses replace three existing meteorology courses; thus no cost associated with those. Finally, the remaining new courses are taught biennially, minimalizing cost. Thus, the net increase is only one contact hour per semester, resulting in the small expense shown. Equipment/supplies are minimal as the physics department has most everything already. The “other” new costs are associated with additional teaching aid and computing costs. While many concepts in meteorology can utilize teaching aids and computing costs already purchased by physics, additional demonstrations and computer software are required. Prices for these are similar to that for existing physics versions, which forms the basis for this cost estimate.

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)

There will be six modes of assessment: program assessment exams, course final exams, evaluation of written capstone reports, evaluation of research oral presentations, exit survey/interviews, and alumni surveys.

The first assessment exam will be given at the end of the term in the normal entry-level course, 105, and will assess students when they are being introduced to ideas and skills. The second assessment exam will be given in 225, which is normally halfway through the major. This exam will assess students when core ideas and skills are being reinforced and applied to more complex atmospheric phenomena. The third assessment exam will be given in 419/420/499, which is the capstone project for the major. This exam will assess students when they should be proficient in the core ideas and skills that were developed throughout the program.

Randomly selected final exams in 105, 106L, 210 and 225 will be assessed for understanding of the fundamental principles of meteorology and for student ability to connect concepts in meteorology to broader societal, environmental, political, business or ecological issues**.** One laboratory assignment and laboratory report from three random meteorology majors in 370, and the final report in either 420 or 499 for all meteorology majors, will be assessed for ability to demonstrate a basic level of proficiency in designing, conducting, and reporting results from experiments relevant to topics in meteorology.

Because technical writing and oral communication are an integral part of any scientific degree, the assessment checks that all sections of the written portion of the capstone project are thoroughly and

insightfully completed. Furthermore, all narratives, profiles, and relevant sections are factually accurate and documented to support the claims. Finally, a superior level of analytical reasoning and critical thinking based on the student's analysis is demonstrated.

The program will also assess the oral portion of the capstone project. For a successful completion of the oral presentation, the student strives for a high standard of professionalism. This is determined by examining body language (i.e. the student appears poised and comfortable and uses appropriate gestures to emphasize points), vocal presentation (i.e. the student exhibits excellent vocal tone, volume, and pace), eye contact, word choice and tone, use of visual aids, organization (i.e. the student presents information in an organized, logical fashion), and content (i.e. the student uses multiple forms of evidence to support key points).

Finally, in order to track future employment of majors, the program will perform an exit survey/interview in order to count students considering graduate school, teaching, operational meteorology, and other related fields. Furthermore, the program will use alumni surveys conducted by the Office of Institutional Effectiveness to determine the employment success of our students. In order to assess the Operational Meteorology Concentration, the program will use external surveys from regional employers of operational forecasters (such as the local National Weather Service stations and the Savannah River Site Atmospheric Technologies Group), These external surveys will be used to alter the proposed curriculum if necessary. Additionally, reports and recommendations from the accreditation process will also be used to assess the program, as will data from the AMS on certificate awards.

Student Learning Assessment

Expected Student Learning Outcomes	Methods of/Criteria for Assessment
1. Demonstrate an understanding of the fundamental principles of meteorology, which includes climate and either synoptic meteorology or introduction to air pollution.	Three final exams in PHYS225 and either 210 or 215; also program assessment exams for all majors (offered in 105, 225 and either 419 or 420); 80% proficiency
2. Demonstrate an ability to connect concepts in meteorology to broader societal, environmental, political, business or ecological issues**.**	Three final exams in PHYS105, 106L and 210; also program assessment exams for all majors (offered in 105, 225 and either 419 or 420); 80% proficiency
3. Successful student will be able to demonstrate a basic level of proficiency in designing, conducting, and reporting results from experiments relevant to topics in meteorology.	One laboratory assignment and laboratory report from three meteorology majors in PHYS370, and the final report in either 420 or 499 for all meteorology majors; 80% proficiency
4. Successful students will be able to synthesize core knowledge and analytical tools to design a research project relevant to meteorology.	Research project in PHYS 419/420/499 for all meteorology majors; passing grade
5. Successful students will be able to demonstrate the ability to communicate weather information effectively in written and oral form.	Program assessment exams for all meteorology majors (offered in 105, 225 and either 419 or 420); see rubrics below; 80% proficiency

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)

The AMS and Federal Civil Service do not conduct on-site accreditation, but rather review the curriculum of each program to ensure their stringent standards are met. We have already contacted their staff with our proposed curriculum and they have stated it would meet their requirements. Furthermore, the AMS requires four faculty members have the appropriate credentials, which they have confirmed we possess. Thus, accreditation with the AMS and Federal Civil Service should be instantaneous.

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)

The American Meteorological Society offers two certificates: in Consulting Meteorology and in Broadcast Meteorology. These require taking a few courses beyond the BA degree and/or operational meteorology concentration. The College offers all the additional required coursework, and interested students will be advised of these requirements. However, most students will not pursue these certificates, as only a small fraction of meteorology jobs require them (notably TV weathermen).
The Consulting Meteorology certificate requires 11 credit hours beyond the BA. The Broadcast Meteorology certificate requires 14 hours beyond the BA and operational meteorology concentration. Creating additional concentrations for these options was considered excessive given the low expected demand for them (students will be informed of the curriculum needed to receive these AMS certificates through advising instead).

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

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

College of Charleston Artium Baccalaureatus (A.B.)

The Artium Baccalaureatus (A.B.) degree is the traditional bachelor's degree conferred by the College of Charleston when the study of Classics formed the core curriculum for all students. Currently, the A.B. is awarded to students who follow this tradition and include significant coursework in Classics in their undergraduate studies. Students in any major may elect to work towards the A.B. instead of a Bachelor of Arts or Bachelor of Science degree by including Ancient Greek or Latin language and humanities courses exploring Classical civilization in their general education coursework. All students at the College of Charleston must satisfy General Education requirements in foreign languages and humanities so by careful course selection, earning the A.B. need not add any additional requirements.

According to the *College of Charleston Undergraduate Catalog*, in order to graduate with an A.B. degree, the student must: **(1) complete all required courses in any major; (2) achieve advanced proficiency in either Latin or Ancient Greek, demonstrated by the completion of two courses in one of these languages at the 300 level or above (LATN 301, 305, 321, 322, 323, 371, 372, 373, 390, 490 or two courses from GREK 321, 322, 323, 324, 325, 326, 371, 372, 390, 490)*; and (3) complete two in classical civilization (see listing below).**

*Note: The Classics A.B. major requires both Greek and Latin languages.

ARTH 214 Ancient Greek Art
ARTH 215 Ancient Roman Art
CLAS 101 Greek Civilization
CLAS 102 Roman Civilization
CLAS 103 Classical Mythology
CLAS 104 Introduction to Classical Archaeology
CLAS 105 History of the Classical World
CLAS 121 Classical Greece (travel course)
CLAS 122 Bronze Age Greece (travel course)
CLAS 203 Special Topics
CLAS 221 Field Methods in Classical Archaeology I
CLAS 222 Field Methods in Classical Archaeology II
CLAS 223 Aegean Prehistory
CLAS 225 The Archaeology of Athens
CLAS 226 The Archaeology of Rome
CLAS 242 Images of Women in Classical Antiquity
CLAS 253 Ancient Epic
CLAS 254 Tragedy
CLAS 255 Comedy
CLAS 256 Ancient Satire
CLAS 270 The Classics in Cinema
CLAS 301 Topics in Ancient Greek Literature
CLAS 302 Topics in Latin Literature
CLAS 303 Topics in Classical Civilization
CLAS 320 State Formation in the Greco-Roman World
CLAS 322 Mediterranean Landscapes
CLAS 324 Ancient Mediterranean Economies
CLAS 343 Luxury and Status in Ancient Rome
CLAS 345 Love, Beauty, and Sexuality in the Greco-Roman World
CLAS 356 Ancient Roman Letters
HIST 230 Ancient Egypt and Mesopotamia
HIST 231 Ancient Greece
HIST 232 Ancient Rome
PHIL 201 History of Ancient Philosophy

Sources

1. Artium Baccalaureatus. *College of Charleston Undergraduate Catalog 2015-16.* http://catalogs.cofc.edu/undergraduate/artium-baccalaureatus-ab.htm
2. Artium Baccalaureatus. College of Charleston Department of Classics. http://classics.cofc.edu/documents/ab-degree.pdf