

**PROGRAM MODIFICATION PROPOSAL**

Name of Institution  
University of South Carolina Upstate

Name of Program (include concentrations, options, and tracks)  
Bachelor of Arts in Chemistry

Program Designation

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

Does the program qualify for supplemental Palmetto Fellows and LIFE Scholarship awards?  
 Yes  
 No

Proposed Date of Implementation  
Fall 2018

CIP Code  
40.0501

Delivery Site(s)  
USC Upstate main campus (Spartanburg, SC)

Delivery Mode

- Traditional/face-to-face\*               Distance Education  
\*select if less than 50% online               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

- |  |       |           |
|--|-------|-----------|
| 1. Division of Natural Sciences and Engineering            | _____ | 1/10/2018 |
| 2. Academic Affairs Committee                              | _____ | 2/2/2018  |
| 3. Faculty Senate  | _____ | 2/23/2018 |
| 4. Provost and Senior Vice Chancellor for Academic Affairs | _____ | 2/26/2018 |
| 5. Chancellor  | _____ | 2/26/2018 |
| 6. President   | _____ |           |
| 7. Board of Trustees                                       | _____ |           |

### Background Information

Provide a detailed description of the proposed modification, including its nature and purpose and centrality to institutional mission. (1500 characters)

Students at USC Upstate may currently earn a BS degree in chemistry that prepares students for graduate level work, as well as employment in industry. The BS degree has an American Chemical Society Certified track that requires in-depth study of advanced topics and many hours of lab coursework (including undergraduate research that must be experiment-based). We propose a BA degree that would be tailored for students who either want to enter the chemical workforce immediately after graduation but don't need in-depth coursework or for those students who want to pursue a field that has significant chemical content (pre-health disciplines such as medicine, pharmacy, dentistry, etc.), but do not have plans to attend chemistry graduate school.

A significant number of students have expressed interest in a BA degree since it would allow substantial study in the field, though be flexible enough to allow students the opportunity to pursue minors or double majors in education, business, biology, math, computer science, or other related fields.

The largest strength of the BA degree—the ability to connect chemistry with other fields of study—will not only be attractive to a wide swath of students who have multiple areas of interest, but helps broaden USC Upstate students' education by making chemistry more interdisciplinary. As we prepare students for the future workforce, we will need those who have deep knowledge (the BS-PhD pipeline), but also those who are more broadly educated in multiple fields of study, which this BA degree allows. The recently announced Strategic Plan at USC Upstate states it is committed to offering innovative, career-relevant academic programs and this BA would allow opportunities for multi-disciplinary study.

List the objectives of the modified program. (1500 characters)

Students with a BA chemistry degree will:

- (1) Possess the knowledge and skills for entry-level jobs in the chemical workforce.** Students will have required coursework in both foundational chemistry classes and upper level chemistry classes, as well as physics and upper level calculus. They will have a minimum of five lab courses (with elective hours for more), including analytical chemistry which contains the most relevant skill set for entry-level chemistry workforce positions. Students will take both Junior and Senior Seminar courses in chemistry so that communication and chemical information retrieval skills will be well developed.
- (2) Be at a competitive advantage for entrance to professional schools with a significant chemistry content.** Students planning on attending medical, pharmacy, dental school and the like, already require at least two years of chemistry—this degree will further round out those studies to provide more applications and knowledge that will help them in both entrance exams as well as in their practice. The chemistry underlying these fields becomes more established each year, so additional study beyond just the requirements for professional schools will provide additional resources for students pursuing these advanced degrees.
- (3) Be able to combine chemistry with other fields of study to tailor their desired educational goals.** With the flexibility of this degree, students will have the option to pursue programs of study in both chemistry and another area such as biology, teaching, journalism, entrepreneurship, etc.

**PROGRAM MODIFICATION PROPOSAL**

## PROGRAM MODIFICATION PROPOSAL

### Assessment of Need

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

According to the Bureau of Labor Statistics, the job outlook for chemists for the next decade (2016-2026) is expected to grow at 7%.<sup>1</sup> In Spartanburg County there are 45 chemical manufacturing companies listed by the Spartanburg Economic Futures Group, but many more companies require chemistry-related knowledge for quality assurance/control, analytical testing, waste treatment, product finishing, etc. not included on the list.

With the continued expansion of BMW and BMW-related industries in the Upstate, it has created an increase in chemistry-related jobs. Recently, Toray (Japanese carbon fiber manufacturer), Ritrama (Italian adhesive company), and Hemmelrath (German paint and coatings producer) have all moved into Spartanburg county with a strong demand for a workforce that needs both the knowledge and skills found in a chemistry degree.

Within the Upstate region, Indeed.com (March 2018) listed 71 *entry-level* chemistry jobs within a 100-mile radius of Greenville, SC. Statewide, Indeed.com listed 52 *entry-level* positions. In addition, there are many more jobs requiring experience for which BA degree holders will have qualifications after being employed for a few years, making their degree even more mobile.

Additionally, a recent Greenville News article,<sup>2</sup> cites studies that the entire state of South Carolina has been designated as medically underserved, with Spartanburg County among the most hard-hit. Graduating more students in STEM fields going to medical, pharmacy, and dental school will help reduce this problem.

1. <https://www.bls.gov/ooh/life-physical-and-social-science/chemists-and-materials-scientists.htm>
2. <http://www.greenvilleonline.com/story/news/health/2017/10/04/amid-growing-shortage-programs-look-produce-more-doctors-upstate/723136001/>

Will the proposed modification impact any existing programs and services at the institution?

Yes

No

If yes, explain. (1000 characters)

We currently offer a BS degree in chemistry and the new BA option will complement the current degree by giving students an alternate route to pursue the field of chemistry.

CHE has noted that the number of current chemistry graduates does not meet the higher standards of the 2017 guidelines. To rectify this, we have begun an outreach campaign to address low enrollment in the chemistry program by:

- contacting admitted students identified as chemistry majors and encouraging them to attend USC Upstate,
- making new, chemistry-specific recruitment materials that will be sent to high schools state-wide,
- offering a University 101 course for chemistry majors in Fall 2018 to promote retention,
- building skills with a pre-semester, online tutorial for students scoring poorly on their math placement test,
- targeting high school chemistry teachers in the Greenville/Spartanburg area to showcase the department's faculty, instrumentation, resources, and facilities, and
- attending local career fairs to encourage students to attend USC Upstate and major in chemistry.

These efforts will promote both the BS and BA (once approved) programs and we are confident they will increase overall graduation rates in chemistry at USC Upstate.

ACAP  
03/29/2018  
Agenda Item 3b

## **PROGRAM MODIFICATION PROPOSAL**

The BA will increase enrollment in upper level chemistry courses, but we feel there is still capacity in our classrooms and labs to meet this demand.

**PROGRAM MODIFICATION PROPOSAL**

**List of Similar Programs in South Carolina**

<b>Program Name</b>	<b>Institution</b>	<b>Similarities</b>	<b>Differences</b>
Bachelor of Arts in chemistry	The Citadel	Requires two semesters each of general and organic chemistries, calculus, and physics.	The Citadel requires a two-course sequence in the same field, an upper level elective, plus research. We would require one course each in analytical and physical chemistry, junior and senior seminar, plus 2-3 upper level courses that could be distributed among several areas of study or concentrated in a few areas depending on the students' goals. Research is an elective, but not required. Citadel Tuition: \$11,364/year USC Upstate Tuition: \$10,710/year
Bachelor of Arts in chemistry	Clemson University	Requires two semesters each of general chemistry, organic chemistry, and physics; requires one semester of analytical chemistry, and senior seminar.	Clemson requires an additional semester of calculus and physical chemistry, but not junior seminar. Clemson requires 6 hours of chemistry electives, USC Upstate requires 7 hours. Clemson Tuition: \$14,712/year USC Upstate Tuition: \$10,710/year
Bachelor of Arts in chemistry	College of Charleston	Requires two semesters of general chemistry, two semesters of organic chemistry, one semester of analytical chemistry, and senior seminar.	College of Charleston requires two semesters of physical chemistry, three semesters of calculus (or one semester of calculus with an additional specialized calculus course focused on chemical applications), and only requires one upper level elective. USC Upstate requires just one physical chemistry, only two semesters of calculus, and 2-3 upper level electives in addition to junior seminar. College of Charleston Tuition: \$11,322/year USC Upstate Tuition: \$10,710/year
Bachelor of Arts in chemistry	Converse College (private)	Requires general chemistry, two semesters of organic chemistry, physics, and calculus; one semester each of analytical and physical chemistry, junior and senior seminars.	Converse has a gender-restricted undergraduate program, while ours is not. Converse requires inorganic chemistry, undergraduate research, and 6 hours of upper level electives (inorganic and undergraduate research are electives for USC Upstate and we require 7 hours of upper level electives). USC Upstate requires an additional course in general chemistry. Converse Tuition: \$16,500/year USC Upstate Tuition: \$10,710/year

**PROGRAM MODIFICATION PROPOSAL**

**Description of the Program**

<b>Projected New Enrollment</b>						
<b>Year</b>	<b>Fall</b>		<b>Spring</b>		<b>Summer</b>	
	Headcount	Credit Hours	Headcount	Credit Hours	Headcount	Credit Hours
2018-2019	4	60	3	45		
2019-2020	4	60	3	45		
2020-2021	4	60	3	45		
2021-2022	5	75	3	45		
2022-2023	5	75	3	45		

**Curriculum**

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

See attached last two pages.

The BA degree differs from the current BS degree by removing the Calculus III (MATH U241) requirement and some chemistry classes would move from required courses to electives (Inorganic Chemistry (CHEM U511), Physical Chemistry II lecture (CHEM U542), Physical Chemistry I and II labs (CHEM U541L, U542L), and Biochemistry I (CHEM U581)). Seven hours of elective credits in upper level chemistry courses would still be mandatory to ensure a well-rounded education.

**Curriculum Changes**

**Note: Complete this table only if there are changes to the curriculum.**

<b>Courses Eliminated from Program</b>	<b>Courses Added to Program</b>

## PROGRAM MODIFICATION PROPOSAL

### Faculty

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

Current staffing levels of eight full-time chemistry faculty should be sufficient to meet the increased demand in students. No changes in administrative assignment or overview is anticipated.

### Resources

Identify any new library/learning resources, new instructional equipment, and new facilities or modifications to existing facilities needed to support the modified program. (2000 characters)

The Library at USC Upstate contains more than 243,000 volumes, 24/7 reference library help, study rooms available during regular library hours, and a 24/7 computer lab for student use. Online resources include access to the American Chemical Society suite of journals, ScienceDirect (Elsevier journals), Wiley Online Library, individual journals such as Science and Nature, as well as searchable databases such as the Chemical Abstract Service (CAS), SciFinder Scholar, and Web of Science. For students interested in pre-health fields, there is access to MEDLine Complete, the Merck Index, and TOXNET.

The library has a dedicated math/science reference librarian to assist with information retrieval and training on various databases.

The holdings are substantial and access to chemical information exceeded criteria for gaining American Chemical Society Certification for the BS degree in 2016.

We feel the library resources are more than adequate for the current and anticipated increased enrollment. Additional resources beyond the needs of the current chemistry degree (BS) will not be required.

**PROGRAM MODIFICATION PROPOSAL**

**Financial Support**

<b>Estimated New Costs by Year</b>						
<b>Category</b>	<b>1<sup>st</sup></b>	<b>2<sup>nd</sup></b>	<b>3<sup>rd</sup></b>	<b>4<sup>th</sup></b>	<b>5<sup>th</sup></b>	<b>Total</b>
Program Administration						0
Faculty and Staff Salaries						0
Graduate Assistants						0
Equipment						0
Facilities						0
Supplies and Materials	\$880	\$2320	\$2800	\$2960	\$3200	\$12,160
Library Resources						0
Other*						0
<b>Total</b>	<b>\$880</b>	<b>\$2320</b>	<b>\$2800</b>	<b>\$2960</b>	<b>\$3200</b>	<b>\$12,160</b>
<b>Sources of Financing</b>						
<b>Category</b>	<b>1<sup>st</sup></b>	<b>2<sup>nd</sup></b>	<b>3<sup>rd</sup></b>	<b>4<sup>th</sup></b>	<b>5<sup>th</sup></b>	<b>Total</b>
Tuition Funding	\$74,970	\$74,970	\$74,970	\$85,680	\$85,680	\$396,270
Program-Specific Fees	\$880	\$2320	\$2800	\$2960	\$3200	\$12,160
State Funding (i.e., Special State Appropriation)*						
Reallocation of Existing Funds*						
Federal Funding*						
Other Funding*						
<b>Total</b>	<b>\$75,850</b>	<b>\$77,290</b>	<b>\$77,770</b>	<b>\$88,640</b>	<b>\$88,880</b>	<b>\$408,430</b>
<b>Net Total (i.e., Sources of Financing Minus Estimated New Costs)</b>	<b>\$74,970</b>	<b>\$74,970</b>	<b>\$74,970</b>	<b>\$85,680</b>	<b>\$85,680</b>	<b>\$396,270</b>

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

## PROGRAM MODIFICATION PROPOSAL

### 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.**

Estimated New Costs: Under "Supplies and Materials", as we anticipate more students in lab courses, this will incur a cost for additional chemicals, new glassware, instrument wear and tear, etc..

Sources of New Financing: The cost of "Supplies and Materials" is recuperated in the "Program Specific Fees" as students are charged \$80 for each lab course (lecture courses are not assessed this fee).

These values were determined by enrollment data and assuming regular progression through the curriculum. In the first year, four students would take CHEM U111L in the Fall (F1 cohort), then those four would progress to CHEM U112L in the Spring, when an additional three new students (S1 cohort) would enroll in CHEM U111L (thus, 11 lab courses would be taken for the first year,  $11 \times \$80 = \$880$ ). In the second year, the F1 cohort would progress to CHEM U331L, the S1 cohort would progress to CHEM U112L, a new fall cohort of four (F2) would start CHEM U111L. In the second year Spring, the F1 cohort would take both CHEM 321L and CHEM 332L, the S1 cohort would take CHEM U331L, the F2 cohort would take CHEM 112L, and a new S2 cohort of three would take CHEM 111L (thus, 29 lab courses for the second year,  $29 \times \$80 = \$2320$ ).

### Evaluation and Assessment

Will any the proposed modification impact the way the program is evaluated and assessed?

Yes

No

If yes, explain. (1000 characters)

### PROGRAM MODIFICATION PROPOSAL

The BS degree is currently assessed looking at lab skills in CHEM U321L, reports in CHEM U331L and U332L, writing ability in CHEM U541L and U542L, computer skills in CHEM U321L, U541, U541L, and U542L research papers in CHEM U397 and U599, oral presentations in CHEM U599, retrieval of chemical information in CHEM U397 and U599, exit interviews in CHEM U599, and the Major Fields Assessment Test (MFAT) taken in CHEM U599. The MFAT is a nationally distributed online exam allowing comparison of our students with those across the country and provides results across the major disciplines within chemistry (analytical, inorganic, organic, and physical chemistry).

Students pursuing a BA won't necessarily have the background for all of these areas (since some of those courses have been moved to electives, e.g. inorganic and physical chemistry II), so subject-specific exams will be used to assess students in CHEM U599. The American Chemical Society provides subject-specific exams that can be used to assess students with their peers across the country. Students pursuing the BA degree will be given exams which match the coursework they completed (i.e., organic, analytical, first semester physical chemistry, and appropriate electives). Students completing the BA will not be required to take some courses in which writing ability and computer skills are assessed (CHEM U541L and U542L), but such skills are assessed in other areas such as CHEM U321L, U397, and U599 and students may opt for some of these courses as electives.

Will the proposed modification affect or result in program-specific accreditation?

Yes

No

If yes, explain; if the modification will result in the program seeking program-specific accreditation, provide the institution's plans to seek accreditation, including the expected timeline for accreditation. (500 characters)

Will the proposed modification affect or lead to licensure or certification?

Yes

No

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

**PROGRAM MODIFICATION PROPOSAL**

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**Teacher or School Professional Preparation Programs**

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

Yes

No

If yes, complete the following components.

Area of Certification

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

**PROGRAM MODIFICATION PROPOSAL**

Proposed Curriculum to include the BA option in chemistry at USC Upstate

Requirement Area	Sub Area / Topic	# credit hours	Courses	Completed	
<b>I. Communication</b>	English	6	ENGL U101, U102		
	Speech	3	SPCH U201, U201R		
<b>II. Mathematics, Logic &amp; Natural Sciences<sup>1,2</sup></b>	Mathematics	8	MATH U141, U142		
	Natural Sci. (w/ lab)	8	CHEM U111, U112		
<b>III. Info. Technology</b>	Info Technology	3	CSCI U138, U150; INFO U101		
<b>IV. Fine Arts, Humanities &amp; History</b>	Fine Arts	3	AFAM U204; ARTH U101, U105, U106; MUSC U110, U140; THEA U161, U170		
	History	3	HIST U101, U102, U105, U106		
	Fine Arts, Humanities	3	Any Fine Arts course listed above or AMST U101, U102; FILM U240; PHIL U102, U211; RELG U103		
<i>The minimum acceptable level of competency is completion of the 101 level of a language. Students who place into the 102 or higher level of a language satisfy the language requirement but will have additional hours in general education electives, if hours are required by their degree program.</i>					
<b>V. Foreign Language &amp; Culture</b>	Foreign Language	3	ASLG U101; CHIN U101; FREN U101; GERM U101; SPAN U101		
<b>VI. Social &amp; Behavioral Sciences</b>	Social & Behavioral Science	6	Two courses from the following with two disciplines represented: AFAM U201; ANTH U102; ECON U221, U222; GEOG U101, U103; POLI U101, U320; PSYC U101; SOCY U101; WGST U101		
<i>Choose from the options below if hours are required in the major.</i>					
<b>VII. Gen Ed. Electives</b>	Gen. Ed. Elect.	0	Any General Education course or courses.		

