To: Curriculum Committee
From: Pam Riggs-Gelasco, Chair Chemistry and Biochemistry
RE: Single change to BS Chem, BS Biochem, and BA Chem degree requirements and additional options to meet pre-requisites for Chem 341 and Chem 342

In the 2014-15 Catalog, the Math requirement for Chemistry BA, Chemistry BS, and Biochemistry BS programs were changed from Math 120 and Math 220 to Math 120 (4 credit) and Math 229 (5 credit). Math 229 blends Math 220, Math 221, and Math 203 topics in such a way as to serve as preparation for the Chem 341-Chem 342 Physical Chemistry sequence.

We would like to include a second pathway through Math for our students to accommodate the needs of Chem/Math double majors, Chem/Physics double majors, and our transfer students. The alternative path would be allowing a traditional sequence of Math 120-Math 220-Math 221 to serve as a substitute for the condensed Math 120-Math 229 sequence. We would anticipate most students will employ the intended pathway, Math 120-Math 229, but a small subset of mathematically inclined students would be taking and should be taking the full Calc III course (for math minors, for math double majors, or physics double majors). In addition, this will help transfer students transition better into the program, since most of those students will have a traditional Calc 2 or Calc 3 background, and it would be silly for them to take Math 229 for the small amount of linear algebra in the course.

The following forms are included:
Change Program for Chemistry BA
Change Program for Chemistry BS
Change Program for Biochemistry BS
Change in Course form for Chem 341
Change in Course form for Chem 342
Program worksheet corrections for Chemistry BA
Program worksheet corrections for Chemistry BS
Program worksheet corrections for Biochemistry BS
Email from Chair of Math approving of change
Email from Chair of Physics approving of change
FACULTY CURRICULUM COMMITTEE
SIGNATURE PAGE

- In section A, list ALL of the forms covered by this signature page. If you submit a form that is not listed in A, your proposal will be held back until we receive a new, updated signature page.
- You must obtain the signature of your department chair and dean before submitting your proposal.

A. FORMS COVERED BY THIS SIGNATURE PAGE. List each form you are submitting—for instance, PSYC 383, Course Form; PSYC, Change of Major Form; PSYC, Change of Minor Form.

  Change Program, Chemistry BA
  Change Program, Chemistry BS
  Change Program, Biochemistry BS
  Change Course Form, Chem 341
  Change Course Form, Chem 342
  Chemistry BS Major Program Worksheet Corrections for registrar
  Biochemistry BS Major Program Worksheet Corrections for registrar
  Chemistry BA Program Worksheet Corrections for registrar

B. APPROVAL AND SIGNATURES.

1. Signature of Department Chair or Program Director:
   [Signature] Date: 1/30/15

2. Signature of Academic Dean:
   [Signature] Date: 1/30/2015

3. Signature of Provost:
   [Signature] Date: 2/10/15

4. Signature of Business Affairs (only for course fees):
   [Signature] Date: ____________ □ fee approved on ____________ □ BOT approval pending

5. Signature of Curriculum Committee Chair:
   [Signature] Date: 2/20/2015

6. Signature of Budget Committee Chair (only for new programs):
   [Signature] Date: ____________

7. Signature of Academic Planning Committee Chair (only for new programs):
   [Signature] Date: ____________

8. Signature of Faculty Senate Secretary:
   [Signature] Date: ____________

Date Approved by Faculty Senate: ___________________
Hi Pam,

The Physics and Astronomy Department supports allowing double majors (Chemistry/Physics) to meet their Chem/Biochem math requirements through the traditional sequence of Math 120-Math 220-Math 221. The alternative pathway will allow Physics/Chemistry double majors to economize on the number of courses required to be successful in both degrees.

Best,
-NK.

Narayanan Kuthirummal, PhD
Chair, Department of Physics and Astronomy
College of Charleston.

Office: JC LONG 215
9 Liberty Street, Charleston, SC 29401.

Phone: 843-953-7457
Fax: 843-953-4824
kuthirummaln@cofc.edu
Pam,

The Math Department agrees with the addition of an alternative pathway to achieve the Math requirement for the Chemistry and Biochemistry degrees. By allowing double majors (Chemistry/Math) to take the traditional sequence of Math 120-Math 220-Math 221 instead of the normal expedited pathway (Math 120-Math 229), we will economize on the coursework required for success in both degrees.

Sincerely yours,

Robert Mignone, Chair  
Department of Mathematics
FACULTY CURRICULUM COMMITTEE
COURSE FORM

Instructions:

• Please fill out one of these forms for each course you are adding, changing, deactivating, or reactivating.
• Fill out the parts of the form specified in part B. You must do this before your request can move forward!
• Remember that your changes will not be implemented until the next catalog year at the earliest.
• If you have questions, start by checking the instructions on the website. Please feel free to contact the committee chairs with any remaining questions you might have.

A. CONTACT/COURSE INFORMATION.

Name: Pam Riggs-Gelasco
Phone: 3-7455
Email: gelascop@cofc.edu

Department or Program: Chemistry and Biochemistry
School: SSM

Subject Acronym and Course Number: Chem 341

Catalog Year in which changes will take effect: FALL 2016 (though it would be really nice if these could go in earlier since it is an additional pre-req option; rather than making it more challenging to take this course, this change will make it easier for some students to enroll so it seems like this could go into place in Fall 2015)

B. TYPE OF REQUEST. Please check all that apply, then fill out the specified parts of the form.

☐ Add a New Course (complete parts C, D, F, G, H, I, J)
☐ Change Part of an Existing Course (complete parts C, D, E, F, G, I, J)
☐ Course Number (you must submit a course deactivation request for the old course number)
☐ Course Name
☐ Course Description
☐ Credit/Contact Hours
☒ Restrictions (prerequisites, co-requisites, junior/senior standing, etc.)
☐ Deactivate an Existing Course (complete parts C, D, E, G, I, J)
☐ Reactivate a Previously-Deactivated Course (complete parts C, D, E, G, I, J)

C. RATIONALE AND EXPLANATION. Please describe your request and explain why you are making it.

We would like to include a second pathway through Math for our students to accommodate the needs of Chem/Math double majors, Chem/Physics double majors, and our transfer students. The alternative path would be allowing a traditional sequence of Math 120-Math 220-Math 221 to serve as a substitute for the condensed Math 120-Math 229 sequence. We would anticipate most students will employ the intended pathway, Math 120-Math 229, but a small subset of mathematically inclined students would be taking and should be taking the full Calc III course (for math minors, for math double majors, or physics double majors). In addition, this will help transfer students transition better into the program, since most of those students will have a traditional Calc 2 or Calc 3 background, and it would be silly for them to take Math 229 for the small amount of linear algebra in the course. This new option requires the pre-req option to be listed for Chem 341 and Chem 342.

D. IMPACT ON EXISTING PROGRAMS AND COURSES. Please briefly describe the impact of your request on your own programs and courses as well other programs and courses. If another program requires the course, you must submit their written acknowledgement with this proposal. Also, the affected program must describe any change in the number of credit hours they require. Include a list of similar courses in other departments and explain any overlap.

This form was last updated on 12/13/13 and replaces all others.
This change makes it easier for double majors to simultaneously meet the requirements of math or physics department and our department.
E. EXISTING COURSE INFORMATION. If you are proposing a new course, just leave this blank. Otherwise, please fill out all fields.

Department: ___________________________ School: ___________________________ Subject Acronym: ___________________________ Course Number: ___________________________

Credit hours: _3_ lecture _ _ lab _ _ seminar _ _ independent study
Contact hours: _3_ lecture _ _ lab _ _ seminar _ _ independent study

Course title: Thermodynamics, Statistical Thermodynamics and Chemical Kinetics

Course description (maximum 50 words, exactly as it appears in the catalog): No changes are being requested for this, but here it is.

An examination of the laws of classical thermodynamics, followed by applications to the properties of gases, liquids, and solids, as well as to solutions, phase and chemical equilibria. Chemical reaction thermodynamics and the kinetic theory of gases at equilibrium. An introduction to statistical thermodynamics, phenomenological transport and electrochemical reactions are discussed.

Restrictions (pre-requisites, co-requisites, majors only, etc.): Current pre-req is Chem 220/220L and Math 229. Co-requisite: Chem 341L

Cross-listing, if any:

Is this course repeatable? □ yes □ no If yes, how many total credit hours may the student earn? ______

F. NEW COURSE INFORMATION. If you are deactivating a course, leave this blank. Otherwise, please fill out all fields. For changed courses, use boldface for the information that is changing.

Department: ___________________________ School: ___________________________ Subject Acronym: ___________________________ Course Number: ___________________________

Credit hours: 3 _ _ lecture _ _ lab _ _ seminar _ _ independent study
Contact hours: 3 _ _ lecture _ _ lab _ _ seminar _ _ independent study

Course title: Thermodynamics, Statistical Thermodynamics and Chemical Kinetics

No change needed in the title.

Course description (maximum 50 words, exactly as it appears in the catalog): No change needed. It is the same as existing course description.

An examination of the laws of classical thermodynamics, followed by applications to the properties of gases, liquids, and solids, as well as to solutions, phase and chemical equilibria. Chemical reaction thermodynamics and the kinetic theory of gases at equilibrium. An introduction to statistical thermodynamics, phenomenological transport and electrochemical reactions are discussed.
Restrictions (pre-requisites, co-requisites, majors only, etc.):

The requested change is: Chem 220/220L, Math 229 OR Math 220 AND Math 221.

If this is a newly-created course, is it intended to be the equivalent of an existing course? ☐ yes ☐ no
If so, which course? ________________

If equivalent, will the newly-created course replace the existing course? ☐ yes ☐ no
Note: If yes, you must deactivate that course by submitting an additional Course Form.

Cross-listing, if any (submit approval from relevant department): ________________
Note: Cross-listed courses are equivalent.

Is this course repeatable? ☐ yes ☒ no If yes, how many total credit hours may the student earn? ___

Is there an activity, lab, or other fee associated with this course? ☐ yes ☒ no What is the fee? $_____
Note: The Senate cannot approve new fees; Business Affairs will submit any such request to the Board of Trustees. The course can still be created, but the fee will not be attached until the Board has approved it.

G. COSTS. List all of the new costs or cost savings (including new faculty/staff requests, library, equipment, etc.) associated with your request.

No new costs. Students taking second option will generate more tuition.

H. STUDENT LEARNING OUTCOMES AND ASSESSMENT.

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Method and Performance Expected</th>
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<td>What will students know and be able to do when they complete the course?</td>
<td>How will each outcome be measured? Who will be assessed, when, and how often? How well should students be able to do on the assessment?</td>
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<tr>
<td>1. Apply the basic concepts of calculus and physics to concepts in chemistry.</td>
<td>Each learning outcome is assessed in an end-of-the-term, national, standardized exam written by the American Chemical Society. All students are assessed once at the end of the term. We expect passing students to perform at the 70th percentile or above.</td>
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<td>2. Be proficient in reading and interpreting complex graphs and figures presenting experimental data.</td>
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Be comfortable reading advanced physical chemistry textbooks and find the necessary information in the textbooks needed to solve a particular problem.

4. Learn selected history of science pertaining to quantum mechanics with emphasis on the early development of this theory, the new concepts therein and the modifications of human reasoning toward the subatomic world.

5. Understand the postulates and structure of quantum mechanics.

6. Understand how to think about quantum mechanical systems and how to apply this knowledge to atomic and molecular structure, systems of chemical interest, and spectroscopy.

7. Be able to set up and solve simple quantum mechanical problems, identify and understand any assumption(s) needed to solve a problem, and discuss the properties of the solutions.

8. Learn the fundamentals of group theory and understand the basic applications of group theory to molecular symmetry, structure and spectroscopy.

Each learning outcome is assessed in an end-of-the-term, national, standardized exam written by the American Chemical Society. All students are assessed once at the end of the term. We expect passing students to perform at the 70th percentile or above.

How does this course align with the student learning outcomes articulated for the major, program, or general education? What program-level outcome or outcomes does it support? Is the content or skill introduced, reinforced, or demonstrated in this course?

The main SLO that will be facilitated by this course is: Chemistry majors will demonstrate proficiency in one or more of the more narrowly defined sub-disciplines of Chemistry, which include Analytical, Biochemistry, Inorganic, Organic, or Physical chemistry. This course is one of two that deals specifically with mastery of physical chemistry. Physical chemistry topics are introduced in Chem 111, Chem 112, Chem 231, Chem 232, Chem 351, Chem 352, and Chem 311. However, at the end of the two course sequence in physical chemistry, students demonstrate proficiency.

In addition, this course is required for an American Chemical Society-certified degree in chemistry and meets their guidelines as such.
I. PROGRAM CHANGES. Will this course be added to the existing degree requirements or list of approved electives of a major, minor, or concentration? ☒ yes ☐ no

If yes, please attach a Change Minor and/or Change Major/Program Form as appropriate.

No, the modified course does not need to be added to the major since it is already there.
Yes, we are nonetheless attaching change of major forms because the Math degree requirement options are being expanded.

J. CHECKLIST.

☐ I have completed all relevant parts of the form.

☐ I have attached a cover letter that describes my request and lists all the documents I am submitting.

☐ (For new courses only) I have attached a syllabus.

☐ (For courses used in any way by other departments, including cross-listing) I have attached an acknowledgement from the relevant department.

☐ (For courses intended to fulfill a Gen Ed requirement) I have submitted the proposal to the Gen Ed committee.

☐ I have submitted one Signature Form that lists all of the different forms I am submitting.
Sorry, the 342L and 341L should still remain co-requisites. Thanks for catching.

Pam

Hi Pam,
The Registrar's Office is reviewing your proposals for changes to CHEM 341 and 342. Please see the two questions below.
Thank you,
Cathy

Catherine C. Boyd
Registrar
College of Charleston
Charleston, SC 29424
boydc@cofc.edu
Phone 843.953.1826
Fax 843.953.6560

Here is what Jerry and I have for the CHEM proposals:

- CHEM 341 Course (change) Form
Currently, CHEM 341 has a co-requisite of CHEM 341L. In Section F, there is no mention of a CHEM 341L co-requisite. Is this intended?

- CHEM 342 Course (change) Form
Currently, CHEM 342 has a co-requisite of CHEM 342L. In Section F, there is no mention of a CHEM 342L co-requisite. Is this intended?
FACULTY CURRICULUM COMMITTEE
COURSE FORM

Instructions:
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A. CONTACT/COURSE INFORMATION.

Name: Pam Riggs-Gelasco
Phone: 3-7455
Email: gelascop@cofc.edu

Department or Program: Chemistry and Biochemistry
School: SSM

Subject Acronym and Course Number: Chem 342

Catalog Year in which changes will take effect: FALL 2016 (though it would be really nice if these could go in earlier since it is an additional pre-req option; rather than making it more challenging to take this course, this change will make it easier for some students to enroll so it seems like this could go into place in Fall 2015)

B. TYPE OF REQUEST. Please check all that apply, then fill out the specified parts of the form.

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We would like to include a second pathway through Math for our students to accommodate the needs of Chem/Math double majors, Chem/Physics double majors, and our transfer students. The alternative path would be allowing a traditional sequence of Math 120-Math 220-Math 221 to serve as a substitute for the condensed Math 120-Math 229 sequence. We would anticipate most students will employ the intended pathway, Math 120-Math 229, but a small subset of mathematically inclined students would be taking and should be taking the full Calc III course (for math minors, for math double majors, or physics double majors). In addition, this will help transfer students transition better into the program, since most of those students will have a traditional Calc 2 or Calc 3 background, and it would be silly for them to take Math 229 for the small amount of linear algebra in the course. This new option requires the pre-req option to be listed for Chem 341 and Chem 342.

D. IMPACT ON EXISTING PROGRAMS AND COURSES. Please briefly describe the impact of your request on your own programs and courses as well other programs and courses. If another program requires the course, you must submit their written acknowledgement with this proposal. Also, the affected program must describe any change in the number of credit hours they require. Include a list of similar courses in other departments and explain any overlap.

This form was last updated on 12/13/13 and replaces all others.
This change makes it easier for double majors to simultaneously meet the requirements of math or physics department and our department.
E. EXISTING COURSE INFORMATION. If you are proposing a new course, just leave this blank. Otherwise, please fill out all fields.

Department: 
School: 
Subject Acronym: 
Course Number: 

Credit hours: __3 lecture __ lab __ seminar __ independent study
Contact hours: __3 lecture __ lab __ seminar __ independent study

Course title: Quantum Chemistry and Spectroscopy

Course description (maximum 50 words, exactly as it appears in the catalog): No changes are being requested for this, but here it is.

Application of Quantum mechanics to chemical bonding and spectroscopy. The examination of the fundamental ideas of quantum mechanics and their applications to simple model systems such as the linear harmonic oscillator and a confined particle, and to atomic and molecular structure. Application of quantum theory to electronic vibrational, rotational and magnetic resonance spectroscopies.

Restrictions (pre-requisites, co-requisites, majors only, etc.): Current pre-req is Chem 220/220L and Math 229. Co-req: Chem 342L

Cross-listing, if any:

Is this course repeatable? □ yes ☒ no If yes, how many total credit hours may the student earn? ___

F. NEW COURSE INFORMATION. If you are deactivating a course, leave this blank. Otherwise, please fill out all fields. For changed courses, use **boldface** for the information that is changing.

Department: 
School: 
Subject Acronym: 
Course Number: 

Credit hours: __3 lecture __ lab __ seminar __ independent study
Contact hours: __3 lecture __ lab __ seminar __ independent study

Course title: Quantum Chemistry and Spectroscopy

No change needed in the title.

Course description (maximum 50 words, exactly as it appears in the catalog): No change needed. It is the same as existing course description.

Application of Quantum mechanics to chemical bonding and spectroscopy. The examination of the fundamental ideas of quantum mechanics and their applications to simple model systems such as the linear harmonic oscillator and a confined particle, and to atomic and molecular structure. Application of quantum theory to electronic vibrational, rotational and magnetic resonance spectroscopies.
Restrictions (pre-requisites, co-requisites, majors only, etc.):

The requested change is: Chem 220/220L, Math 229 OR Math 220 AND Math 221. 

If this is a newly-created course, is it intended to be the equivalent of an existing course? ☐ yes ☐ no
If so, which course? __________________

If equivalent, will the newly-created course replace the existing course? ☐ yes ☐ no
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Cross-listing, if any (submit approval from relevant department): ____________
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2. Be proficient in reading and interpreting complex graphs and figures presenting experimental data.

Each learning outcome is assessed in an end-of-the-term, national, standardized exam written by the American Chemical Society. All students are assessed once at the end of the term. We expect passing students to perform at the 70th percentile or above.

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Be comfortable reading advanced physical chemistry textbooks and find the necessary information in the textbooks needed to solve a particular problem.

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In addition, this course is required for an American Chemical Society-certified degree in chemistry and meets their guidelines as such.
I. PROGRAM CHANGES. Will this course be added to the existing degree requirements or list of approved electives of a major, minor, or concentration?  ☒ yes  ☐ no

If yes, please attach a Change Minor and/or Change Major/Program Form as appropriate.

No, the modified course does not need to be added to the major since it is already there.
Yes, we are nonetheless attaching change of major forms because the Math degree requirement options are being expanded.

J. CHECKLIST.

☐ I have completed all relevant parts of the form.

☐ I have attached a cover letter that describes my request and lists all the documents I am submitting.

☐ (For new courses only) I have attached a syllabus.

☐ (For courses used in any way by other departments, including cross-listing) I have attached an acknowledgement from the relevant department.

☐ (For courses intended to fulfill a Gen Ed requirement) I have submitted the proposal to the Gen Ed committee.

☐ I have submitted one Signature Form that lists all of the different forms I am submitting.
Czwazka, Franklin James

From: Riggs-Gelasco, Pamela Jo
Sent: Thursday, February 05, 2015 3:49 PM
To: Boyd, Cathy
Cc: Springer, Bonnie C; Ford, Lynne E; Czwazka, Franklin James; Mackeldon, Jerry W; Bergstrom, Mary C
Subject: Re: Change Course CHEM 341, CHEM 342

Sorry, the 342L and 341L should still remain co-requisites. Thanks for catching.

Pam

From: <Boyd>, Cathy <BoydC@cofc.edu>
Date: Thursday, February 5, 2015 3:47 PM
To: "Riggs-Gelasco, Pamela Jo" <gelascop@cofc.edu>
Cc: "Springer, Bonnie C" <SpringerB@cofc.edu>, "Ford, Lynne E" <Fordl@cofc.edu>, "Czwazka, Franklin James" <CzwazkaF@cofc.edu>, "Mackeldon, Jerry W" <Mackeldonjl@cofc.edu>, "Bergstrom, Mary C" <BergstromM@cofc.edu>
Subject: FW: Change Course CHEM 341, CHEM 342

Hi Pam,
The Registrar’s Office is reviewing your proposals for changes to CHEM 341 and 342. Please see the two questions below.

Thank you,
Cathy

Catherine C. Boyd
Registrar
College of Charleston
Charleston, SC 29424
boydc@cofc.edu
Phone 843.953.1826
Fax 843.953.6560

From: Czwazka, Franklin James
Sent: Thursday, February 05, 2015 2:20 PM
To: Boyd, Cathy
Cc: Mackeldon, Jerry W
Subject: FW: Change Course CHEM 341, CHEM 342

Here is what Jerry and I have for the CHEM proposals:

- **CHEM 341 Course (change) Form**
Currently, CHEM 341 has a co-requisite of CHEM 341L. In Section F, there is no mention of a CHEM 341L co-requisite. Is this intended?

- **CHEM 342 Course (change) Form**
Currently, CHEM 342 has a co-requisite of CHEM 342L. In Section F, there is no mention of a CHEM 342L co-requisite. Is this intended?
CHEMISTRY BA—ADDING FLEXIBILITY IN COGNATE MATH REQUIREMENT

FACULTY CURRICULUM COMMITTEE
CHANGE/DELETE PROGRAM FORM

Instructions:

• Please fill out all of the portions of the form that are specified in section B. You must do this before your request can move forward!
• Remember that your changes will not be implemented until the next catalog year at the earliest.
• If you have questions, please start by checking the detailed instructions on the website.
• Please feel free to contact the committee chair with any remaining questions you might have.

A. CONTACT INFORMATION.

Name: Pam Riggs-Gelasco  Phone: 3-7455  Email: gelascop@cofc.edu

School: SSM
Department or Program: Chemistry
Name and Acronym of Major: Chemistry (Bachelor of Arts), CHEM

B. CATEGORY OF REVIEW. Please check all that apply, then fill out the specified parts of the form.

☒ Change Request (fill out all sections)
☐ Add an existing course to requirements or electives
☐ Add a new course to requirements or electives (attach completed course form for each)
☐ Delete courses from requirements or electives
☐ Add or modify concentration*
☒ Add or modify cognate*  

*Note: Only concentrations and cognates requiring 18 or more credit hours will be tracked in Banner and Degree Works and noted on the transcript.

☐ Terminate Program (fill out E, G, H, and I)
☐ Terminate degree
☐ Terminate major
☐ Terminate concentration
☐ Terminate cognate

C. GENERAL INFORMATION

Number of Current Credit Hours (for existing program): 42+
Number of Proposed Credit Hours (for changed program): Math requirement can be 9 credits or 12 credits
Catalog Year in which changes will take effect: FALL 2015

D. CURRICULUM. Please list every change you are making below AND attach the current Program of Study Worksheet for this major (http://registrar.cofc.edu/program-of-study-resources/program-of-study-worksheets/index.php) with changes marked in RED. Additions should show where the course will be inserted, deletions should be noted by crossing out the course, and moves indicated with arrows. Distinguish between required and elective courses, and note any prerequisites, co-requisites, sequencing, or other restrictions. Provide the catalog description and course list exactly as they should appear in the catalog. For each new course, submit the Curriculum Committee’s Course Form and a sample syllabus.

This form was last updated on 6/6/2013 and replaces all others.
Add Math 120-Math 220-Math 221 as another option to fulfill math requirements for all degrees in the chemistry department (Chem BA, Chem BS, Biochem BS)

E. RATIONALE AND EXPLANATION. Please provide a narrative addressing the request you are making and why you are making it.

In the 2014-15 Catalog, the Math requirement for Chemistry BA, Chemistry BS, and Biochemistry BS programs were changed from Math 120 and Math 220 to Math 120 (4 credit) and Math 229 (5 credit). Math 229 blends Math 220, Math 221, and Math 203 topics in such a way as to serve as preparation for the Chem 341-Chem 342 Physical Chemistry sequence.

We would like to include a second pathway through Math for our students to accommodate the needs of Chem/Math double majors, Chem/Physics double majors, and our transfer students. The alternative path would be allowing a traditional sequence of Math 120-Math 220-Math 221 to serve as a substitute for the condensed Math 120-Math 229 sequence. We would anticipate most students will employ the intended pathway, Math 120-Math 229, but a small subset of mathematically inclined students would be taking and should be taking the full Calc III course (for math minors, for math double majors, or physics double majors). In addition, this will help transfer students transition better into the program, since most of those students will have a traditional Calc 2 or Calc 3 background, and it would be silly for them to take Math 229 for the small amount of linear algebra in the course.

F. STUDENT LEARNING OUTCOMES AND ASSESSMENT.

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Method and Performance Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>What will students know and be able to do when they complete the major or program?</td>
<td>How will each outcome be measured? Who will be assessed, when, and how often? How well should students be able to do on the assessment?</td>
</tr>
<tr>
<td>1. The BA Chemistry major will demonstrate proficiency in the broader discipline of Chemistry.</td>
<td>How: Educational Testing Service Major Field Test in Chemistry which is administered each spring as part of the required Senior Seminar capstone in the major, CHEM 492. CHEM 492 must be taken the spring semester immediately preceding graduation. Who: All majors When: Within final year of time at CoC</td>
</tr>
<tr>
<td>2. The BA Chemistry major will demonstrate proficiency in one or more of the more narrowly defined sub-disciplines of Chemistry, which include Analytical, Biochemistry, Inorganic, Organic, or Physical chemistry.</td>
<td>How: Educational Testing Service Major Field Test in Chemistry which is administered each spring as part of the required Senior Seminar capstone in the major, CHEM 492.</td>
</tr>
</tbody>
</table>

This form was last updated on 6/6/2013 and replaces all others.
| 3. The BA Chemistry major will demonstrate a positive appreciation for the educational experiences received within our department. | When: CHEM 492 must be taken the spring semester immediately preceding graduation.  
How Well: We expect that, on average, our students will score at or above the 60% percentile on this instrument in terms of their score on at least one of the sub-disciplinary test areas. While the test does not have a biochemistry section, it does filter out and provide a score for the smaller number of biochemistry related questions.  
Who: all majors |
|---|---|
| 4. BA Chemistry majors achieve success in attaining career goals | How: Senior survey administered as part of the CHEM 492 course, response to these questions: “Your experience in the department has served you well in preparation for your anticipated career goals” & “My overall opinion of the Department of Chemistry and Biochemistry is that it is an excellent department” and senior survey administered by the College of Charleston should reflect high satisfaction with the major  
Who: All majors  
When: Senior year  
How well: >70% in College’s exit senior survey in the area of overall academic experience and program of study. >70% rate strongly agree to questions in our own survey.  
|  
| The majority of BA Chemistry majors participate in research opportunities as a capstone experience. | How: The department will track student career intentions prior to leaving campus by using iBiosketch, required exit surveys, Facebook, and LinkedIn.  
Who: all majors  
When: just prior to graduation and after graduation updates periodically  
How well: Our hope is that 75% of students desiring to stay in science will successfully be matriculated in a graduate program or will be successfully employed.  
|  
| How: We will track research participation by requiring mandatory safety training in all research courses and for summer research participation. We will catch outside research experiences via our required senior survey. We will assess if research participation ends in successful career outcomes based on student goals using iBiosketch, surveys, and communication with faculty working with students.  
Who: all majors  
When: tracking will occur primarily in senior year, but annual records are kept  
How well: We would like 75% or more of our majors to get a research experience.
G. IMPACT ON EXISTING PROGRAMS AND COURSES. Please describe the impact of this request on other programs and courses. If you are deleting a program, please describe the effect on all programs that will be impacted; if you are adding or changing a program, please explain any overlap with existing programs at the College.

We are making this change in cooperation with the Physics and Math Department.

H. COSTS ASSOCIATED WITH THE REQUESTED ACTION. List all of the new costs or cost savings (including new faculty/staff requests, library, or equipment) associated with your request.

None

I. CHECKLIST

☐ I have completed all relevant parts of the form.

☐ I have attached a cover letter that describes my request and lists all the documents I am submitting.

☐ I have attached a Course Form for each newly-created or modified course.

☐ (For proposals that affect other departments in any way) I have attached an acknowledgement from the relevant department.

☐ I have provided the complete curriculum for the program, concentration, emphasis, etc., including the description and course list, exactly as it should appear in the catalog.
□ I have submitted one Signature Form that lists all of the different forms I am submitting.
Chemistry Major Requirements
Catalog Year: 2014-15
Degree: Bachelor of Arts
Credit Hours: 40

"PR" indicates a pre-requisite. "CO" indicates a co-requisite.

Courses within this major may also satisfy general education requirements. Please consult http://registrar.cofc.edu/general-edu for more information.

Required Courses
- CHEM 111 Principles of Chemistry (3) PR: MATH 111 or equivalent; CO: CHEM 111L
- CHEM 111L Principles of Chemistry Lab (1) CO: CHEM 111
- CHEM 112 Principles of Chemistry (3) PR: CHEM 111, CHEM 111L or HONS 153, HONS 153L; CO: CHEM 112L
- CHEM 112L Principles of Chemistry Lab (1) CO: CHEM 112
- CHEM 220 Fundamentals of Analytical Chemistry (3) PR: CHEM 112 and CHEM 112L or HONS 154 and HONS 154L; CO: CHEM 220L
- CHEM 220L Fundamentals of Analytical Chemistry Lab (2) PR: CHEM 112 and CHEM 112L or HONS 154 and HONS 154L; CO: CHEM 220
- CHEM 231 Organic Chemistry (3) PR: CHEM 112, CHEM 112L or HONS 154, HONS 154L; CO: CHEM 231L
- CHEM 231L Introduction to Organic Chemistry Laboratory Techniques (1) CO: CHEM 231
- CHEM 232 Organic Chemistry (3) PR: CHEM 231, CHEM 231L; CO: CHEM 232L
- CHEM 232L Organic Synthesis and Analysis (1) CO: CHEM 232
- CHEM 341 Physical Chemistry (3) PR: CHEM 220/220L and MATH 220; CO: CHEM 341L (MATH 221 is strongly recommended.)
- CHEM 341L Physical Chemistry Laboratory (1) CO: CHEM 341
- CHEM 342 Physical Chemistry (3) PR: CHEM 341, CHEM 341L; CO: CHEM 342L
- CHEM 342L Physical Chemistry Laboratory (1) CO: CHEM 342
- CHEM 492 Senior Seminar (1) PR: CHEM 341 and senior standing

Additional Chemistry Elective: Select 3 credit hours from any 300-level or above CHEM course excluding CHEM 483.

- CHEM 311 Inorganic Chemistry (3) PR: CHEM 232, CHEM 232L
- CHEM 312L Inorganic Chemistry Laboratory (1) CO: CHEM 311
- CHEM 343 Introduction to Modeling in Chemistry (1) PR: CHEM 231, CHEM 231L
- CHEM 351 Biochemistry (3) PR: CHEM 232, CHEM 232L
- CHEM 352 Biochemistry (3) PR: CHEM 351
- CHEM 353 Chemical Biology (3) PR: CHEM 351
- CHEM 354 Biochemistry Laboratory (1) PR: CHEM 351
- CHEM 355 Research Methods in Biochemistry (2) PR: CHEM 354L
- CHEM 356 Biochemical Basis of Disease (2) PR: CHEM 351
- CHEM 371 Chemical Synthesis Character (3) PR: CHEM 220, CHEM 220L, CHEM 232, CHEM 232L
- CHEM 381* Internship (1, repeatable up to 4) PR: Junior or senior standing and at least a 2.50 GPA both overall and in major
CHEM 399 * Tutorial (3; repeatable up to 12) PR: Junior or senior standing and at least a 2.50 GPA both overall and in major

CHEM 421 Instrumental Methods of Analysis (3) PR: CHEM 220, CHEM 220L; CO: CHEM 421L

CHEM 421L Instrumental Laboratory (1) PR: CHEM 220, CHEM 220L; CO: CHEM 421

CHEM 422 Environmental Chemistry (3) PR: CHEM 220, CHEM 220L

CHEM 422L Environmental Chemistry Laboratory (1) PR or CO: CHEM 422

CHEM 431 Advanced Organic Chemistry (3) PR: CHEM 232, CHEM 232L

CHEM 441 Advanced Physical Chemistry (3) PR: CHEM 341, CHEM 342

CHEM 481 Introductory Research (2) PR: Instructor permission

CHEM 482 Introductory Research II (2) PR: Instructor permission

CHEM 490 Chemistry and Biochemistry Seminar (1) PR: Junior or senior standing

CHEM 499 Bachelor's Essay (6) PR: Instructor permission; a project proposal must be submitted in writing and approved by the department prior to registration for the course

Notes: *CHEM 381 is repeatable up to 4 credit hours earned. *CHEM 399 is repeatable up to 12 credit hours earned.

Math Requirement

☐ MATH 120 Introductory Calculus (4) PR: Placement or C- or better in MATH 111

☐ MATH 229 Vector Calculus with Chemical Applications (5) PR: Placement or C- or better MATH 120 or HONS 115

Physics Majors should take the double major math sequence of MATH 120, MATH 220, MATH 221, and PHYS 201.

Honors students can take the alternative sequence of HONS 191/HONS 191L, HONS 192/HONS 192L, HONS 293/HONS 293L, and HONS 294/HONS 294L in lieu of MATH 111/111L, CHEM 112/112L, CHEM 231/231L, and CHEM 232/232L. Please note in this case CHEM 220/220L cannot be taken until CHEM 294/294L is complete.

All junior and senior chemistry majors are strongly encouraged to attend the scheduled departmental seminars.

Students who have completed PHYS 101 Introductory Physics I and PHYS 102 Introductory Physics II before declaring a chemistry or biochemistry major may satisfy this requirement by taking additional related courses. Please see the department chair for the list of courses.

OR

☐ MATH 120 Introductory Calculus (4) PR: Placement or C- or better in MATH 111

☐ MATH 220 Calculus II (4) PR: MATH 120 or HONS 115

☐ MATH 221 Calculus III (4) PR: MATH 220
BIOCHEMISTRY BS--ADDING FLEXIBILITY IN COGNATE MATH REQUIREMENT

FACULTY CURRICULUM COMMITTEE
CHANGE/DELETE PROGRAM FORM

Instructions:
- Please fill out all of the portions of the form that are specified in section B. You must do this before your request can move forward!
- Remember that your changes will not be implemented until the next catalog year at the earliest.
- If you have questions, please start by checking the detailed instructions on the website.
- Please feel free to contact the committee chair with any remaining questions you might have.

A. CONTACT INFORMATION.

Name: Pam Riggs-Gelasco
Phone: 3-7455 Email: gelascope@cofc.edu
School: SSM Department or Program: Chemistry
Name and Acronym of Major: Biochemistry (Bachelor of Science), CHEM BIOC

B. CATEGORY OF REVIEW. Please check all that apply, then fill out the specified parts of the form.

☐ Change Request (fill out all sections)
  ☐ Add an existing course to requirements or electives
  ☐ Add a new course to requirements or electives (attach completed course form for each)
  ☐ Delete courses from requirements or electives
  ☐ Add or modify concentration*
  ☐ Add or modify cognate*

*Note: Only concentrations and cognates requiring 18 or more credit hours will be tracked in Banner and Degree Works and noted on the transcript.

☐ Terminate Program (fill out E, G, H, and I)
  ☐ Terminate degree
  ☐ Terminate major
  ☐ Terminate concentration
  ☐ Terminate cognate

C. GENERAL INFORMATION

Number of Current Credit Hours (for existing program): 424 75†
Number of Proposed Credit Hours (for changed program): Math requirement can be 9 credits or 12 credits
Catalog Year in which changes will take effect: FALL 2015

D. CURRICULUM. Please list every change you are making below AND attach the current Program of Study Worksheet for this major (http://registrar.cofc.edu/program-of-study-resources/program-of-study-worksheets/index.php) with changes marked in RED. Additions should show where the course will be inserted, deletions should be noted by crossing out the course, and moves indicated with arrows. Distinguish between required and elective courses, and note any prerequisites, co-requisites, sequencing, or other restrictions. Provide the catalog description and course list exactly as they should appear in the catalog. For each new course, submit the Curriculum Committee’s Course Form and a sample syllabus.

This form was last updated on 6/6/2013 and replaces all others.
BIOCHEMISTRY BS----ADDING FLEXIBILITY IN COGNATE MATH REQUIREMENT

Add Math 120-Math 220-Math 221 as another option to fulfill math requirements for all degrees in the chemistry department (Chem BA, Chem BS, Biochem BS)

E. RATIONALE AND EXPLANATION. Please provide a narrative addressing the request you are making and why you are making it.

In the 2014-15 Catalog, the Math requirement for Chemistry BA, Chemistry BS, and Biochemistry BS programs were changed from Math 120 and Math 220 to Math 120 (4 credit) and Math 229 (5 credit). Math 229 blends Math 220, Math 221, and Math 203 topics in such a way as to serve as preparation for the Chem 341-Chem 342 Physical Chemistry sequence.

We would like to include a second pathway through Math for our students to accommodate the needs of Chem/Math double majors, Chem/Physics double majors, and our transfer students. The alternative path would be allowing a traditional sequence of Math 120-Math 220-Math 221 to serve as a substitute for the condensed Math 120-Math 229 sequence. We would anticipate most students will employ the intended pathway, Math 120-Math 229, but a small subset of mathematically inclined students would be taking and should be taking the full Calc III course (for math minors, for math double majors, or physics double majors). In addition, this will help transfer students transition better into the program, since most of those students will have a traditional Calc 2 or Calc 3 background, and it would be silly for them to take Math 229 for the small amount of linear algebra in the course.

F. STUDENT LEARNING OUTCOMES AND ASSESSMENT.

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<tr>
<td>1. The BS Biochemistry major will demonstrate proficiency in the broader discipline of Chemistry.</td>
<td>How: Educational Testing Service Major Field Test in Chemistry which is administered each spring as part of the required Senior Seminar capstone in the major, CHEM 492. CHEM 492 must be taken the spring semester immediately preceding graduation. Who: All majors When: Within final year of time at CofC How well: We expect that, on average, our students will score at or above the 50% percentile on this instrument in terms of their overall score.</td>
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<tr>
<td>2. The BS Biochemistry major will demonstrate proficiency in one or more of the more narrowly defined sub-disciplines of Chemistry, which include Analytical, Biochemistry, Inorganic, Organic, or Physical chemistry.</td>
<td>How: Educational Testing Service Major Field Test in Chemistry which is administered each spring as part of the required Senior Seminar capstone in the major, CHEM 492.</td>
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</table>

This form was last updated on 6/6/2013 and replaces all others.
When: CHEM 492 must be taken the spring semester immediately preceding graduation.

How Well: We expect that, on average, our students will score at or above the 60% percentile on this instrument in terms of their score on at least one of the sub-disciplinary test areas. While the test does not have a biochemistry section, it does filter out and provide a score for the smaller number of biochemistry related questions.

Who: all majors

### 3. The BS Biochemistry major will demonstrate a positive appreciation for the educational experiences received within our department.

| How: Senior survey administered as part of the CHEM 492 course, response to these questions: “Your experience in the department has served you well in preparation for your anticipated career goals” & “My overall opinion of the Department of Chemistry and Biochemistry is that it is an excellent department” and senior survey administered by the College of Charleston should reflect high satisfaction with the major |
| Who: All majors |
| When: Senior year |
| How well: >70% in College’s exit senior survey in the area of overall academic experience and program of study. >70% rate strongly agree to questions in our own survey. |

### 4. BS Biochem majors achieve success in attaining career goals

| How: The department will track student career intentions prior to leaving campus by using iBiosketch, required exit surveys, Facebook, and LinkedIn. |
| Who: all majors |
| When: just prior to graduation and after graduation updates periodically |
| How well: Our hope is that 75% of students desiring to stay in science will successfully be matriculated in a graduate program or will be successfully employed. |

This form was last updated on 6/6/2013 and replaces all others.
5. The majority of BS Biochemistry majors participate in research opportunities as a capstone experience.

How: We will track research participation by requiring mandatory safety training in all research courses and for summer research participation. We will catch outside research experiences via our required senior survey. We will assess if research participation ends in successful career outcomes based on student goals using iBiosketch, surveys, and communication with faculty working with students.

Who: all majors
When: tracking will occur primarily in senior year, but annual records are kept
How well: We would like 75% or more of our majors to get a research experience

Additional Outcomes or Comments:

There are no changes in Learning Outcomes from this additional pathway.

G. IMPACT ON EXISTING PROGRAMS AND COURSES. Please describe the impact of this request on other programs and courses. If you are deleting a program, please describe the effect on all programs that will be impacted; if you are adding or changing a program, please explain any overlap with existing programs at the College.

We are making this change in cooperation with the Physics and Math Department.

H. COSTS ASSOCIATED WITH THE REQUESTED ACTION. List all of the new costs or cost savings (including new faculty/staff requests, library, or equipment) associated with your request.

None

I. CHECKLIST

☐ I have completed all relevant parts of the form.

☐ I have attached a cover letter that describes my request and lists all the documents I am submitting.

This form was last updated on 6/6/2013 and replaces all others.
☐ I have attached a Course Form for each newly-created or modified course.

☐ (For proposals that affect other departments in any way) I have attached an acknowledgement from the relevant department.

☐ I have provided the complete curriculum for the program, concentration, emphasis, etc., including the description and course list, exactly as it should appear in the catalog.

☐ I have submitted one Signature Form that lists all of the different forms I am submitting.
Biochemistry Major Requirements
Catalog Year: 2014-15
Degree: Bachelor of Science
Credit Hours: 75+

"PR" indicates a pre-requisite. "CO" indicates a co-requisite.

Courses within this major may also satisfy general education requirements. Please consult http://registrar.cofc.edu/general-edu for more information.

Required Courses

☐ CHEM 111 Principles of Chemistry (3) PR: MATH 111 or equivalent; CO: CHEM 111L
☐ CHEM 111L Principles of Chemistry Lab (1) CO: CHEM 111

☐ CHEM 112 Principles of Chemistry (3) PR: CHEM 111, CHEM 111L or HONS 153, HONS 153L or HONS 191, HONS 191L; CO: CHEM 112L
☐ CHEM 112L Principles of Chemistry Lab (1) CO: CHEM 112

☐ CHEM 220 Fundamentals of Analytical Chemistry (3) PR: CHEM 112 and CHEM 112L or HONS 154 and HONS 154L; CO: CHEM 220L
☐ CHEM 220L Fundamentals of Analytical Chemistry Lab (2) PR: CHEM 112 and CHEM 112L or HONS 154 and HONS 154L; CO: CHEM 220

☐ CHEM 231 Organic Chemistry (3) PR: CHEM 112, CHEM 112L or HONS 154, HONS 154L; CO: CHEM 231L
☐ CHEM 231L Introduction to Organic Chemistry Laboratory Techniques (1) CO: CHEM 231

☐ CHEM 232 Organic Chemistry (3) PR: CHEM 231, CHEM 231L; CO: CHEM 232L
☐ CHEM 232L Organic Synthesis and Analysis (1) CO: CHEM 232

☐ CHEM 311 Inorganic Chemistry (3) PR: CHEM 232, CHEM 232L

☐ CHEM 341 Physical Chemistry (3) PR: CHEM 220/220L and MATH 220; CO: CHEM 341L (MATH 221 is strongly recommended.)
☐ CHEM 341L Physical Chemistry Laboratory (1) CO: CHEM 341

☐ CHEM 342 Physical Chemistry (3) PR: CHEM 341, CHEM 341L; CO: CHEM 342L
☐ CHEM 342L Physical Chemistry Laboratory (1) CO: CHEM 342

☐ CHEM 351 Biochemistry (3) PR: CHEM 232, CHEM 232L

☐ CHEM 352 Biochemistry II (3) PR: CHEM 351

☐ CHEM 354L Biochemistry II (1) PR: CHEM 351

☐ CHEM 490 Chemistry and Biochemistry Seminar (1) PR: Junior or senior standing

☐ CHEM 492 Senior Seminar (1) PR: CHEM 341 and senior standing

Select 2 of the following courses that add up to a minimum of 3 lab credit hours. (Note: CHEM 371 is 2 credit hours lab and 1 credit hour lecture)

CHEM 312L Inorganic Chemistry Laboratory (1) CO: CHEM 311

CHEM 355 Research Methods in Biochemistry (2) PR: CHEM 354L

CHEM 371 Chemical Synthesis Character (3) PR: CHEM 220, CHEM 220L, CHEM 232, CHEM 232L

CHEM 421L Instrumental Laboratory (1) PR: CHEM 220, CHEM 220L; CO: CHEM 421

CHEM 422L Environmental Chemistry Laboratory (1) PR or CO: CHEM 422

CHEM 481 Introductory Research (2) PR: Instructor permission
Select one of the following courses:

<table>
<thead>
<tr>
<th>Course</th>
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</tr>
</thead>
<tbody>
<tr>
<td>CHEM 353</td>
<td>Chemical Biology (3) PR: CHEM 351</td>
</tr>
<tr>
<td>CHEM 356</td>
<td>Biochemical Basis of Disease (2) PR: CHEM 351</td>
</tr>
<tr>
<td>CHEM 421</td>
<td>Instrumental Methods of Analysis (3) PR: CHEM 220, CHEM 220L; CO: CHEM 421L</td>
</tr>
<tr>
<td>CHEM 422</td>
<td>Environmental Chemistry (3) PR: CHEM 220, CHEM 220L</td>
</tr>
<tr>
<td>CHEM 431</td>
<td>Advanced Organic Chemistry (3) PR: CHEM 232, CHEM 232L</td>
</tr>
</tbody>
</table>

**Biology Requirement**

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>BIOL 111</td>
<td>Introduction to Cell and Molecular Biology (3) PR: None; CO: BIOL 111L</td>
</tr>
<tr>
<td>BIOL 111L</td>
<td>Introduction to Cell and Molecular Biology Lab (1) CO: BIOL 111</td>
</tr>
<tr>
<td>OR</td>
<td></td>
</tr>
<tr>
<td>HONS 151</td>
<td>Honors Biology I (3) PR: None; CO: HONS 151L</td>
</tr>
<tr>
<td>HONS 151L</td>
<td>Honors Biology I Lab (1) CO: HONS 151L</td>
</tr>
<tr>
<td>BIOL 112</td>
<td>Evolution, Form, and Function of Organisms (3) PR: BIOL 111 and 111L; CO: BIOL 112</td>
</tr>
<tr>
<td>BIOL 112L</td>
<td>Evolution, Form, and Function of Organisms Lab (1) CO: BIOL 112</td>
</tr>
<tr>
<td>OR</td>
<td></td>
</tr>
<tr>
<td>HONS 152</td>
<td>Honors Biology II (3) PR: HONS 151 and 151L; CO: HONS 152L</td>
</tr>
<tr>
<td>HONS 152L</td>
<td>Honors Biology II Lab (1) CO: HONS 152</td>
</tr>
<tr>
<td>BIOL 312</td>
<td>Molecular Biology (3) PR: BIOL 111 and 111L or HONS 151 and 151L and BIOL 112 and 112L or HONS 152 and 152L; BIOL 211 and 211D and BIOL 305 or CHEM 232 and 232L; and CHEM 111 and 111L and CHEM 112 and 112L; PR or CO: MATH 250 or instructor permission for biochemistry majors</td>
</tr>
<tr>
<td>BIOL 312L</td>
<td>Molecular Biology Laboratory (1) PR or CR: BIOL 312 and MATH 250 or instructor permission for biochemistry majors</td>
</tr>
</tbody>
</table>

**Physics Requirement**

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 111</td>
<td>General Physics I (3) PR or CO: MATH 120 or equivalent or instructor permission; CO: PHYS 111L</td>
</tr>
<tr>
<td>PHYS 111L</td>
<td>General Physics I Lab (1) CO: PHYS 111</td>
</tr>
<tr>
<td>PHYS 112</td>
<td>General Physics II (3) PR: PHYS 111 or HONS 157; CO or PR: MATH 220 or equivalent or instructor permission; CO: PHYS 112L</td>
</tr>
<tr>
<td>PHYS 112L</td>
<td>General Physics II Lab (1) CO: PHYS 112</td>
</tr>
</tbody>
</table>

**Mathematics Requirement**

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 120</td>
<td>Introductory Calculus (4) PR: Placement or C- or better in MATH 111</td>
</tr>
<tr>
<td>MATH 229</td>
<td>Vector Calculus with Chemical Applications (5) PR: Placement or C- or better MATH 120 or HONS 115</td>
</tr>
</tbody>
</table>

**Notes:**

- MATH 250 is a pre-requisite for all 300-level BIOL courses but can be waived with instructor permission for biochemistry majors.
- Honors students can take the alternative sequence of HONS 191/HONS 191L, HONS 192/HONS 192L, HONS 293/HONS 293L, and HONS 294/HONS 294L in lieu of CHEM 111/111L, CHEM 112/112L, CHEM 231/231L, and CHEM 232/232L.
- Honors students can take the alternative sequence of HONS 157/HONS 157L and HONS 158/HONS 158L in lieu of PHYS 111/111L and PHYS 112/112L.

See note on next page.
- MATH 220 is recommended for students who want to go to graduate school. Physics or Math double majors should take the MATH 120, MATH 220, MATH 221 sequence.
- All junior and senior chemistry majors are strongly encouraged to attend the scheduled department seminars.
- Students who have completed PHYS 101 Introductory Physics I and PHYS 102 Introductory Physics II before declaring a chemistry or biochemistry major may satisfy this requirement by taking additional related courses. Please see the department chair for the list of courses.

Insert second math sequence option

OR

☐ Math 120 Introductory Calculus (4)
   PR: Placement or C- or better in Math 111

☐ Math 220 Calculus II (4)
   PR: Math 120 or HONS 115

☐ Math 221 Calculus III (4)
   PR: Math 220
CHEMISTRY BS—ADDING FLEXIBILITY IN COGNATE MATH REQUIREMENT

FACULTY CURRICULUM COMMITTEE
CHANGE/DELETE PROGRAM FORM

Instructions:
- Please fill out all of the portions of the form that are specified in section B. You must do this before your request can move forward!
- Remember that your changes will not be implemented until the next catalog year at the earliest.
- If you have questions, please start by checking the detailed instructions on the website.
- Please feel free to contact the committee chair with any remaining questions you might have.

A. CONTACT INFORMATION.

Name: Pam Rigs-Gelasco Phone: 3-7455 Email: gelascop@cofc.edu
School: SSM Department or Program: Chemistry
Name and Acronym of Major: Chemistry (Bachelor of Science), CHEM

B. CATEGORY OF REVIEW. Please check all that apply, then fill out the specified parts of the form.

☐ Change Request (fill out all sections)
  ☐ Add an existing course to requirements or electives
  ☐ Add a new course to requirements or electives (attach completed course form for each)
  ☐ Delete courses from requirements or electives
  ☒ Add or modify concentration*
  ☐ Add or modify cognate*

*Note: Only concentrations and cognates requiring 18 or more credit hours will be tracked in Banner and Degree Works and noted on the transcript.

☐ Terminate Program (fill out E, G, H, and I)
  ☐ Terminate degree
  ☐ Terminate major
  ☐ Terminate concentration
  ☐ Terminate cognate

C. GENERAL INFORMATION

Number of Current Credit Hours (for existing program): 48
Number of Proposed Credit Hours (for changed program): 48
Catalog Year in which changes will take effect: FALL 2015

D. CURRICULUM. Please list every change you are making below AND attach the current Program of Study Worksheet for this major (http://registrar.cofc.edu/program-of-study-resources/program-of-study-worksheets/index.php) with changes marked in RED. Additions should show where the course will be inserted, deletions should be noted by crossing out the course, and moves indicated with arrows. Distinguish between required and elective courses, and note any prerequisites, co-requisites, sequencing, or other restrictions. Provide the catalog description and course list exactly as they should appear in the catalog. For each new course, submit the Curriculum Committee's Course Form and a sample syllabus.

This form was last updated on 6/6/2013 and replaces all others.
Chemistry BS -- Adding Flexibility in Cognate Math Requirement

Add Math 120-Math 220-Math 221 as another option to fulfill math requirements for all degrees in the chemistry department (Chem BA, Chem BS, Biochem BS)

E. RATIONALE AND EXPLANATION. Please provide a narrative addressing the request you are making and why you are making it.

In the 2014-15 Catalog, the Math requirement for Chemistry BA, Chemistry BS, and Biochemistry BS programs were changed from Math 120 and Math 220 to Math 120 (4 credit) and Math 229 (5 credit). Math 229 blends Math 220, Math 221, and Math 203 topics in such a way as to serve as preparation for the Chem 341-Chem 342 Physical Chemistry sequence.

We would like to include a second pathway through Math for our students to accommodate the needs of Chem/Math double majors, Chem/Physics double majors, and our transfer students. The alternative path would be allowing a traditional sequence of Math 120-Math 220-Math 221 to serve as a substitute for the condensed Math 120-Math 229 sequence. We would anticipate most students will employ the intended pathway, Math 120-Math 229, but a small subset of mathematically inclined students would be taking and should be taking the full Calc III course (for math minors, for math double majors, or physics double majors). In addition, this will help transfer students transition better into the program, since most of those students will have a traditional Calc 2 or Calc 3 background, and it would be silly for them to take Math 229 for the small amount of linear algebra in the course.

F. STUDENT LEARNING OUTCOMES AND ASSESSMENT.

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<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Method and Performance Expected</th>
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<tbody>
<tr>
<td>What will students know and be able to do when they complete the major or program?</td>
<td>How will each outcome be measured? Who will be assessed, when, and how often? How well should students be able to do on the assessment?</td>
</tr>
<tr>
<td>1. The BS Chemistry major will demonstrate proficiency in the broader discipline of Chemistry.</td>
<td>How: Educational Testing Service Major Field Test in Chemistry which is administered each spring as part of the required Senior Seminar capstone in the major, CHEM 492. CHEM 492 must be taken the spring semester immediately preceding graduation. Who: All majors When: Within final year of time at CofC How well: We expect that, on average, our students will score at or above the 50% percentile on this instrument in terms of their overall score.</td>
</tr>
<tr>
<td>2. The BS Chemistry major will demonstrate proficiency in one or more of the more narrowly defined sub-disciplines of Chemistry, which include Analytical, Biochemistry, Inorganic, Organic, or Physical chemistry.</td>
<td>How: Educational Testing Service Major Field Test in Chemistry which is administered each spring as part of the required Senior Seminar capstone in the major, CHEM 492.</td>
</tr>
</tbody>
</table>

This form was last updated on 6/6/2013 and replaces all others. Page 2 of 4
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| **CHEMISTRY BS----ADDING FLEXIBILITY IN COGNATE MATH REQUIREMENT** | When: CHEM 492 must be taken the spring semester immediately preceding graduation.  
How Well: We expect that, on average, our students will score at or above the 60% percentile on this instrument in terms of their score on at least one of the sub-disciplinary test areas. While the test does not have a biochemistry section, it does filter out and provide a score for the smaller number of biochemistry related questions.  
Who: all majors | |
| **3. The BS Chemistry major will demonstrate a positive appreciation for the educational experiences received within our department.** | How: Senior survey administered as part of the CHEM 492 course, response to these questions: “Your experience in the department has served you well in preparation for your anticipated career goals” & “My overall opinion of the Department of Chemistry and Biochemistry is that it is an excellent department” and senior survey administered by the College of Charleston should reflect high satisfaction with the major  
Who: All majors  
When: Senior year  
How well:  >70% in College’s exit senior survey in the area of overall academic experience and program of study.  
>70% rate strongly agree to questions in our own survey. | |
| **4. BS Chemistry majors achieve success in attaining career goals** | How: The department will track student career intentions prior to leaving campus by using iBiosketch, required exit surveys, Facebook, and LinkedIn.  
Who: all majors  
When: just prior to graduation and after graduation updates periodically  
How well: Our hope is that 75% of students desiring to stay in science will successfully be matriculated in a graduate program or will be successfully employed. | |
| **5. The majority of BS Chemistry majors participate in research opportunities as a capstone experience.** | How: We will track research participation by requiring mandatory safety training in all research courses and for summer research participation. We will catch outside research experiences via our required senior survey. We will assess if research participation ends in successful career outcomes based on student goals using iBiosketch, surveys, and communication with faculty working with students.  
Who: all majors  
When: tracking will occur primarily in senior year, but annual records are kept  
How well: We would like 75% or more of our majors to get a research experience | |

This form was last updated on 6/6/2013 and replaces all others.
CHEMISTRY BS—ADDONG FLEXIBILITY IN COGNATE MATH REQUIREMENT

Additional Outcomes or Comments:

There are no changes in Learning Outcomes from this additional pathway.

G. IMPACT ON EXISTING PROGRAMS AND COURSES. Please describe the impact of this request on other programs and courses. If you are deleting a program, please describe the effect on all programs that will be impacted; if you are adding or changing a program, please explain any overlap with existing programs at the College.

We are making this change in cooperation with the Physics and Math Department.

H. COSTS ASSOCIATED WITH THE REQUESTED ACTION. List all of the new costs or cost savings (including new faculty/staff requests, library, or equipment) associated with your request.

None

I. CHECKLIST

☐ I have completed all relevant parts of the form.

☐ I have attached a cover letter that describes my request and lists all the documents I am submitting.

☐ I have attached a Course Form for each newly-created or modified course.

☐ (For proposals that affect other departments in any way) I have attached an acknowledgement from the relevant department.

☐ I have provided the complete curriculum for the program, concentration, emphasis, etc., including the description and course list, exactly as it should appear in the catalog.

☐ I have submitted one Signature Form that lists all of the different forms I am submitting.

This form was last updated on 6/6/2013 and replaces all others.
Chemistry Major Requirements
Catalog Year: 2014-15
Degree: Bachelor of Science
Credit Hours: 58+ 2-4

"PR" indicates a pre-requisite. "CO" indicates a co-requisite.

Courses within this major may also satisfy general education requirements. Please consult http://registrar.cofc.edu/general-edu for more information.

Required Courses

☐ CHEM 111 Principles of Chemistry (3) PR: MATH 111 or equivalent; CO: CHEM 111L
☐ CHEM 111L Principles of Chemistry Lab (1) CO: CHEM 111

☐ CHEM 112 Principles of Chemistry (3) PR: CHEM 111, CHEM 111L or HONS 153, HONS 153L or HONS 191 or 191L; CO: CHEM 112L
☐ CHEM 112L Principles of Chemistry Lab (1) CO: CHEM 112

☐ CHEM 220 Fundamentals of Analytical Chemistry (3) PR: CHEM 112 and CHEM 112L or HONS 154 and HONS 154L; CO: CHEM 220L
☐ CHEM 220L Fundamentals of Analytical Chemistry Lab (2) PR: CHEM 112 and CHEM 112L or HONS 154 and HONS 154L; CO: CHEM 220

☐ CHEM 231 Organic Chemistry (3) PR: CHEM 112, CHEM 112L or HONS 154, HONS 154L; CO: CHEM 231L
☐ CHEM 231L Introduction to Organic Chemistry Laboratory Techniques (1) CO: CHEM 231

☐ CHEM 232 Organic Chemistry (3) PR: CHEM 231, CHEM 231L; CO: CHEM 232L
☐ CHEM 232L Organic Synthesis and Analysis (1) CO: CHEM 232

☐ CHEM 311 Inorganic Chemistry (3) PR: CHEM 232, CHEM 232L

☐ CHEM 312L Inorganic Chemistry Laboratory (1) CO: CHEM 311

☐ CHEM 341 Physical Chemistry (3) PR: CHEM 220, CHEM 220L and MATH 220; CO: CHEM 341L (MATH 221 is strongly recommended.)
☐ CHEM 341L Physical Chemistry Laboratory (1) CO: CHEM 341

☐ CHEM 342 Physical Chemistry (3) PR: CHEM 341, CHEM 341L; CO: CHEM 342L
☐ CHEM 342L Physical Chemistry Laboratory (1) CO: CHEM 342

☐ CHEM 351 Biochemistry (3) PR: CHEM 232, CHEM 232L

☐ CHEM 371 Chemical Synthesis Character (3) PR: CHEM 220, CHEM 220L, CHEM 232, CHEM 232L
☐ CHEM 371L Chemical Synthesis and Characterization Laboratory (0) CO: CHEM 371

☐ CHEM 421 Instrumental Methods of Analysis (3) PR: CHEM 220, CHEM 220L; CO: CHEM 421L
☐ CHEM 421L Instrumental Laboratory (1) PR: CHEM 220, CHEM 220L; CO: CHEM 421

☐ CHEM 490 Chemistry and Biochemistry Seminar (1) PR: Junior or senior standing

☐ CHEM 492 Senior Seminar (1) PR: CHEM 341 and senior standing

Physics Requirement

☐ PHYS 111 General Physics I (3) PR or CO: MATH 120 or equivalent or instructor permission; CO: PHYS 111L
☐ PHYS 111L General Physics I Lab (1) CO: PHYS 111

☐ PHYS 112 General Physics II (3) PR: PHYS 111 or HONS 157; CO or PR: MATH 220 or equivalent or instructor permission; CO: PHYS 112L
☐ PHYS 112L General Physics II Lab (1) CO: PHYS 112

Math Requirement

☐ MATH 120 Introductory Calculus (4) PR: Placement or C- or better in MATH 111
MATH 229  Vector Calculus with Chemical Applications (5) PR: Placement or C- or better MATH 120 or HONS 115

Notes:

- Computer Programming I (CSCI 220 and 220L) is strongly recommended.
- MATH 220 is recommended for students who want to go to graduate school. Physics and Math double majors should take the Math 120, Math 220, Math 221 sequence.
- Honors students can take the alternative sequence of HONS 191/HONS 191L, HONS 192/HONS 192L, HONS 293/HONS 293L, and HONS 294/HONS 294L in lieu of CHEM 111/111L, CHEM 112/112L, CHEM 231/231L, and CHEM 232/232L. Please note in this case CHEM 220, CHEM 220L cannot be taken until CHEM 294/294L is complete.
- All junior and senior chemistry majors are strongly encouraged to attend the scheduled departmental seminars.
- Students who have completed PHYS 101 Introductory Physics I and PHYS 102 Introductory Physics II before declaring a chemistry or biochemistry major may satisfy this requirement by taking additional related courses. Please see the department chair for the list of courses.

OR

Math 120  Introductory Calculus (4)  PR: Placement or C- or better in Math 111

Math 220  Calculus II (4)  PR: Math 120 or HONS 115

Math 221  Calculus III (4)  PR: Math 220