

Program Modification

Program modifications must be submitted by November 2, 2009 for priority catalog review

Date (Change if modified and update the file name with the new date): 5.15.09, catalog copy; rev 11.17.09

Program Area: CHEMISTRY

Semester /Year First affected: FALL 2010

Instructions: Please use this Program Modification form for changes to existing program requirements, units, outcomes, emphases or options, or for other programmatic concerns. For minor changes (faculty or address changes, additions of approved electives, minor editing for clarity, and other minor updates) use the Program Update form, available at the Curriculum website.

Paste the latest approved version of your entire program in the left AND right boxes below. Make your deletions in the LEFT column by using the **strikeout** feature in Word or underlining, and highlight. Insert new language or other changes to the program on the RIGHT and highlight in **YELLOW** for easy identification. If possible, please align the two columns so that changes appear side-by-side with the original text.

CURRENTLY APPROVED PROGRAM

Chemistry

Programs Offered

- Bachelor of Arts in Chemistry
- Bachelor of Arts in Chemistry, Option in Subject Matter Preparation in Teaching Chemistry
(*Pending CCTC approval*)
- Bachelor of Science in Chemistry
- Bachelor of Science in Chemistry, Option in Biochemistry
- Minor in Chemistry
- Certificate in Chemistry

The Chemistry Program at CSUCI is based on a “Big Ideas” approach to the discipline. Students will learn how to apply the “Big Ideas” skills to their analysis of concepts and problems. In addition to implementing the “Big Ideas” across the curriculum, students learn how to improve their analytical thinking, oral and written communication, and problem solving skills as individuals and in teams. The culmination of the degree involves a Chemistry Capstone in conjunction with a service learning project, internship, or independent research experience. Writing skills are developed in all upper-division Chemistry courses.

PROPOSED PROGRAM

Chemistry

Programs Offered

- Bachelor of Arts in Chemistry
- Bachelor of Arts in Chemistry, Option in Subject Matter Preparation in Teaching Chemistry
(*Pending CCTC approval*)
- Bachelor of Science in Chemistry
- Bachelor of Science in Chemistry, Option in Biochemistry
- Minor in Chemistry
- Certificate in Chemistry

The Chemistry Program at CSUCI is based on a “Big Ideas” approach to the discipline. Students will learn how to apply the “Big Ideas” skills to their analysis of concepts and problems. In addition to implementing the “Big Ideas” across the curriculum, students learn how to improve their analytical thinking, oral and written communication, and problem solving skills as individuals and in teams. The culmination of the degree involves a Chemistry Capstone in conjunction with a service learning project, internship, or independent research experience. Writing skills are developed in all upper-division Chemistry courses.

| | |
|---|---|
| <p>Careers</p> <p>Graduates from the Bachelor of Arts or Bachelor of Science in Chemistry will receive an excellent preparation for securing entrance to a professional program (i.e., medical, veterinary, dentistry, or pharmacy), to graduate school in Chemistry or Biochemistry, and for employment in the academic, private, or public sector as chemists, biochemists, forensic scientists, and materials scientists.</p> <p>The Bachelor of Arts in Chemistry is designed to provide a broad preparation in the chemical sciences. Required courses prepare students in four of the five traditional sub-disciplines of Chemistry: analytical, inorganic, organic, and physical chemistry. The Bachelor of Arts in Chemistry can also serve as the depth of study necessary for securing a Single Subject Credential in Science for teaching at the high school and middle school level. Additional courses in geology, astronomy, and biology are recommended to meet the breadth requirements for this credential.</p> <p>The Bachelor of Science in Chemistry provides an excellent breadth and depth of preparation in Chemistry suitable for obtaining a position at a chemical or pharmaceutical industry, or for admission to graduate school in Chemistry or Biochemistry. Students may select either the general Bachelor of Science in Chemistry or the Biochemistry Option within the Bachelor of Science in Chemistry. The Biochemistry Option overlaps substantially with the requirements for the minor in Biology and students are encouraged to obtain the Biology minor in addition to the Bachelor of Science in Chemistry, Biochemistry Option.</p> <p>The Minor in Chemistry provides non-majors with the Chemistry background that is needed to pursue graduate study or a career in an interdisciplinary field. Students in professional programs (medical, dental, veterinary, pharmacy), or majoring in Biology or Environmental Science and Resource Management, in particular, should consider obtaining a Chemistry minor, since a significant portion of the coursework needed for the Chemistry minor is included in these programs.</p> <p>The Certificate in Chemistry is designed to provide individuals who have already obtained a Bachelor of Arts or Bachelor of Science degree in another discipline with the opportunity to obtain a certificate for advanced Chemistry coursework.</p> <p>Program Learning Outcomes</p> <p>Students graduating from the Chemistry program will be able to:</p> <ul style="list-style-type: none"> • Explain the fundamental concepts of Chemistry; • Evaluate a problem and appropriately apply the fundamental concepts of Chemistry to the problem; • Formulate hypotheses and devise and perform experiments to test a hypothesis as | <p>Careers</p> <p>Graduates from the Bachelor of Arts or Bachelor of Science in Chemistry will receive an excellent preparation for securing entrance to a professional program (i.e., medical, veterinary, dentistry, or pharmacy), to graduate school in Chemistry or Biochemistry, and for employment in the academic, private, or public sector as chemists, biochemists, forensic scientists, and materials scientists.</p> <p>The Bachelor of Arts in Chemistry is designed to provide a broad preparation in the chemical sciences. Required courses prepare students in four of the five traditional sub-disciplines of Chemistry: analytical, inorganic, organic, and physical chemistry. The Bachelor of Arts in Chemistry can also serve as the depth of study necessary for securing a Single Subject Credential in Science for teaching at the high school and middle school level. Additional courses in geology, astronomy, and biology are recommended to meet the breadth requirements for this credential.</p> <p>The Bachelor of Science in Chemistry provides an excellent breadth and depth of preparation in Chemistry suitable for obtaining a position at a chemical or pharmaceutical industry, or for admission to graduate school in Chemistry or Biochemistry. Students may select either the general Bachelor of Science in Chemistry or the Biochemistry Option within the Bachelor of Science in Chemistry. The Biochemistry Option overlaps substantially with the requirements for the minor in Biology and students are encouraged to obtain the Biology minor in addition to the Bachelor of Science in Chemistry, Biochemistry Option.</p> <p>The Minor in Chemistry provides non-majors with the Chemistry background that is needed to pursue graduate study or a career in an interdisciplinary field. Students in professional programs (medical, dental, veterinary, pharmacy), or majoring in Biology or Environmental Science and Resource Management, in particular, should consider obtaining a Chemistry minor, since a significant portion of the coursework needed for the Chemistry minor is included in these programs.</p> <p>The Certificate in Chemistry is designed to provide individuals who have already obtained a Bachelor of Arts or Bachelor of Science degree in another discipline with the opportunity to obtain a certificate for advanced Chemistry coursework.</p> <p>Program Learning Outcomes</p> <p>Students graduating from the Chemistry program will be able to:</p> <ul style="list-style-type: none"> • Explain the fundamental concepts of Chemistry; • Evaluate a problem and appropriately apply the fundamental concepts of Chemistry to the problem; • Formulate hypotheses and devise and perform experiments to test a hypothesis as |
|---|---|

- individuals and in a team;
- Explain key concepts in chemistry effectively through oral and written communication; and
- Interpret and evaluate the chemical literature.

Contact Information

<http://chemistry.csuci.edu>

Faculty

Simone Aloisio, Ph.D.

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 Aliso Hall Room 104
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Bachelor of Arts Degree in
 Chemistry - (120 units)

Lower Division Requirements - 28 units

1. *Chemistry*
 CHEM 121 General Chemistry I4

- individuals and in a team;
- Explain key concepts in chemistry effectively through oral and written communication; and
- Interpret and evaluate the chemical literature.

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Bachelor of Arts Degree in
 Chemistry - (120 units)

Lower Division Requirements - 28 units

Students must obtain a grade of C or better in these courses to

| | | |
|----------|---------------------------------------|---|
| CHEM 122 | General Chemistry II..... | 4 |
| CHEM 250 | Quantitative Analysis..... | 2 |
| CHEM 251 | Quantitative Analysis Laboratory..... | 2 |

2. Math

| | | |
|----------|-------------------|---|
| MATH 150 | Calculus I | 4 |
| MATH 151 | Calculus II | 4 |

3. Physics

Choose one of the following:

| | | |
|----------|---------------------------------|---|
| PHYS 100 | Introduction to Physics I | 4 |
| PHYS 200 | General Physics I | 4 |

Choose one of the following:

| | | |
|----------|----------------------------------|---|
| PHYS 101 | Introduction to Physics II | 4 |
| PHYS 201 | General Physics II | 4 |

Upper Division Requirements - 15 units

| | | |
|----------|--|---|
| CHEM 305 | Computer Applications in Chemistry | 1 |
| CHEM 311 | Organic Chemistry I | 3 |
| CHEM 312 | Organic Chemistry I Laboratory | 1 |
| CHEM 314 | Organic Chemistry II | 3 |
| CHEM 315 | Organic Chemistry II Laboratory | 1 |
| CHEM 371 | Physical Chemistry I..... | 3 |
| CHEM 372 | Physical Chemistry Laboratory | 1 |
| CHEM 499 | Chemistry Capstone..... | 2 |

(Ten units of the above courses will be counted toward lower-division GE categories B1, B3, and B4)

Upper Division Chemistry Electives

12 units

A total of twelve units of electives from those listed below are needed, including a minimum of two lab courses denoted- ^L:

| | | |
|----------|---|----------------|
| CHEM 301 | Environmental Chemistry - Atmosphere and Climate | 3 |
| CHEM 302 | Environmental Chemistry - Soil and Water | 4 ^L |

apply them to the chemistry major.

1. Chemistry

| | | |
|----------|--|---|
| CHEM 121 | General Chemistry I | 4 |
| CHEM 122 | General Chemistry II..... | 4 |
| CHEM 250 | Quantitative Analysis | 3 |
| CHEM 251 | Quantitative Analysis Laboratory | 1 |

2. Math

| | | |
|----------|-------------------|---|
| MATH 150 | Calculus I | 4 |
| MATH 151 | Calculus II | 4 |

3. Physics

Choose one of the following:

| | | |
|----------|---------------------------------|---|
| PHYS 100 | Introduction to Physics I | 4 |
| PHYS 200 | General Physics I | 4 |

Choose one of the following:

| | | |
|----------|----------------------------------|---|
| PHYS 101 | Introduction to Physics II | 4 |
| PHYS 201 | General Physics II | 4 |

Upper Division Requirements - 15 units

Students must obtain a grade of C or better in these courses to apply them to the chemistry major.

| | | |
|----------|--|---|
| CHEM 305 | Computer Applications in Chemistry | 1 |
| CHEM 311 | Organic Chemistry I | 3 |
| CHEM 312 | Organic Chemistry I Laboratory | 1 |
| CHEM 314 | Organic Chemistry II..... | 3 |
| CHEM 315 | Organic Chemistry II Laboratory..... | 1 |
| CHEM 371 | Physical Chemistry I | 3 |
| CHEM 372 | Physical Chemistry Laboratory..... | 1 |
| CHEM 499 | Chemistry Capstone | 2 |

(Ten units of the above courses will be counted toward lower-division GE categories B1, B3, and B4)

Upper Division Chemistry Electives

12 units

A total of twelve units of electives from those listed below are

| | | |
|----------|---|--------------------|
| CHEM 313 | Organic Chemistry I Learning Community | 1 |
| CHEM 316 | Organic Chemistry II Learning Community | 1 |
| CHEM 330 | The History of Science: Non-Western Origins and the Western Revolution (HIST) | 3 ¹ |
| CHEM 335 | The Chemistry of the Kitchen | 3 ¹ |
| CHEM 341 | Drug Discovery and Development (BUS/ECON) | 3 ¹ |
| CHEM 343 | Forensic Science | 3 ^{L, 1} |
| CHEM 344 | Energy and Society | 3 ¹ |
| CHEM 373 | Physical Chemistry II | 3 |
| CHEM 410 | Advanced Organic Synthesis | 4 ^L |
| CHEM 415 | Molecular Structure Determination | 4 ^L |
| CHEM 420 | Advanced Inorganic Chemistry | 3 |
| CHEM 450 | Instrumental Analysis and Laboratory | 4 ^L |
| CHEM 460 | Biochemistry I | 4 ^L |
| CHEM 461 | Biochemistry II | 4 ^L |
| CHEM 465 | Bioinorganic Chemistry | 4 ^L |
| CHEM 490 | Special Topics in Chemistry | 1-3 |
| CHEM 492 | Internship/ Service Learning | 1-3 ^{L,R} |
| CHEM 494 | Independent Research | 1-3 ^{L,R} |
| CHEM 497 | Directed Studies | 1-3 ^R |

¹A maximum of three units of upper-division interdisciplinary GE credit (CHEM 330-349 or CHEM 430-449) may be applied as chemistry electives towards the degree.

^R No more than a combined total of six units of CHEM 492, 494, and 497 may be applied as electives. No more than one CHEM 492 or CHEM 494 may be (by petition) considered a laboratory elective.

Required Supporting and Other GE Courses

45 units

| | |
|--|----|
| American Institutions Requirement | 6 |
| Other Courses in GE Categories A-E | 39 |
| Electives in Any Discipline | 20 |

Proposed Course of Study,

needed, including a minimum of two lab courses denoted- ^L:
Students must obtain a grade of C or better in these courses to apply them to the chemistry major.

| | | |
|----------|---|--------------------|
| CHEM 301 | Environmental Chemistry - Atmosphere and Climate | 3 |
| CHEM 302 | Environmental Chemistry - Soil and Water | 4 ^L |
| CHEM 313 | Organic Chemistry I Learning Community | 1 |
| CHEM 316 | Organic Chemistry II Learning Community | 1 |
| CHEM 330 | The History of Science: Non-Western Origins and the Western Revolution (HIST) | 3 ¹ |
| CHEM 335 | The Chemistry of the Kitchen | 3 ¹ |
| CHEM 341 | Drug Discovery and Development (BUS/ECON) | 3 ¹ |
| CHEM 343 | Forensic Science | 3 ^{L, 1} |
| CHEM 344 | Energy and Society (PHYS) | 3 ¹ |
| CHEM 373 | Physical Chemistry II | 3 |
| CHEM 410 | Advanced Organic Synthesis | 4 ^L |
| CHEM 415 | Molecular Structure Determination | 4 ^L |
| CHEM 420 | Advanced Inorganic Chemistry | 3 |
| CHEM 450 | Instrumental Analysis and Laboratory | 4 ^L |
| CHEM 460 | Biochemistry I | 4 ^L |
| CHEM 461 | Biochemistry II | 4 ^L |
| CHEM 465 | Bioinorganic Chemistry | 4 ^L |
| CHEM 490 | Special Topics in Chemistry | 1-3 |
| CHEM 491 | Special Laboratory Topics in Chemistry | 1-3 ^L |
| CHEM 492 | Internship/ Service Learning | 1-3 ^{L,R} |
| CHEM 494 | Independent Research | 1-3 ^{L,R} |
| CHEM 497 | Directed Studies | 1-3 ^R |

¹A maximum of three units of upper-division interdisciplinary GE credit (CHEM 330-349 or CHEM 430-449) may be applied as chemistry electives towards the degree.

^R No more than a combined total of six units of CHEM 492, 494, and 497 may be applied as

Bachelor of Arts in Chemistry

First Year

Fall

| | | |
|-------------------------|---------------------------|-----|
| CHEM 121 | General Chemistry I | 4 |
| | GE B1 | |
| MATH 150 | Calculus I | 4 |
| | GE B3 | |
| General Education | | 6-7 |

Spring

| | | |
|-------------------------|----------------------------|-----|
| CHEM 122 | General Chemistry II | 4 |
| MATH 151 | Calculus II | 4 |
| General Education | | 6-7 |

Second Year

Fall

| | | |
|---------------------------|--------------------------------------|-----|
| CHEM 311 | Organic Chemistry I | 3 |
| CHEM 312 | Organic Chemistry I Laboratory | 1 |
| Physics requirement | | 4 |
| (PHYS 100 or 200) | | |
| General Education | | 6-7 |

Spring

| | | |
|---------------------------|--|---|
| CHEM 250 | Quantitative Analysis | 2 |
| CHEM 251 | Quantitative Analysis Laboratory | 2 |
| CHEM 314 | Organic Chemistry II | 3 |
| CHEM 315 | Organic Chemistry II Laboratory | 1 |
| Physics requirement | | 4 |
| (PHYS 101 or 201) | | |
| General Education | | 3 |

Third Year

Fall

| | | |
|---------------------------------------|--|-----|
| CHEM 305 | Computer Applications in Chemistry | 1 |
| | GE B4 | |
| CHEM 371 | Physical Chemistry I | 3 |
| CHEM 372 | Physical Chemistry Laboratory | 1 |
| Chemistry Elective | | 3-4 |
| General Education and Electives | | 6-7 |

electives. No more than one of CHEM 492 or CHEM 494 may be (by petition) considered a laboratory elective.

Required Supporting and Other GE Courses

45 units

| | |
|--|----|
| American Institutions Requirement | 6 |
| Other Courses in GE Categories A-E | 39 |
| Electives in Any Discipline | 20 |

Proposed Course of Study, Bachelor of Arts in Chemistry

First Year

Fall

| | | |
|-------------------------|---------------------------|-----|
| CHEM 121 | General Chemistry I | 4 |
| | GE B1 | |
| MATH 150 | Calculus I | 4 |
| | GE B3 | |
| General Education | | 6-7 |

Spring

| | | |
|-------------------------|----------------------------|-----|
| CHEM 122 | General Chemistry II | 4 |
| MATH 151 | Calculus II | 4 |
| General Education | | 6-7 |

Second Year

Fall

| | | |
|---------------------------|--------------------------------------|-----|
| CHEM 311 | Organic Chemistry I | 3 |
| CHEM 312 | Organic Chemistry I Laboratory | 1 |
| Physics requirement | | 4 |
| (PHYS 100 or 200) | | |
| General Education | | 6-7 |

Spring

| | | |
|---------------------------|--|---|
| CHEM 250 | Quantitative Analysis | 3 |
| CHEM 251 | Quantitative Analysis Laboratory | 1 |
| CHEM 314 | Organic Chemistry II | 3 |
| CHEM 315 | Organic Chemistry II Laboratory | 1 |
| Physics requirement | | 4 |

Spring

| | |
|---------------------------------------|----|
| Chemistry Elective | 4 |
| General Education and Electives | 12 |

Fourth Year

Fall

| | |
|---|-----|
| Chemistry Elective or Independent Research..... | 3-4 |
| General Education and Electives | 12 |

Spring

| | |
|---|-----|
| CHEM 499 Chemistry Capstone | 2 |
| Chemistry Elective or Independent Research..... | 3-4 |
| General Education and Electives | 9 |

Bachelor of Arts Degree in Chemistry,
 Option in Subject Matter Preparation in
 Teaching Chemistry - (120 units)
 (Pending CCTC Approval)

Lower Division Requirements

43 - 44 units

1. *Chemistry*

| | | |
|----------|---------------------------------------|---|
| CHEM 121 | General Chemistry I | 4 |
| CHEM 122 | General Chemistry II | 4 |
| CHEM 250 | Quantitative Analysis..... | 2 |
| CHEM 251 | Quantitative Analysis Laboratory..... | 2 |

2. *Biology*

| | | |
|----------|--|---|
| BIOL 200 | Principles of Organismal and Population Biology | 4 |
| BIOL 201 | Principles of Cell and Molecular Biology | 4 |

| | |
|-------------------------|---|
| (PHYS 101 or 201) | |
| General Education | 3 |

Third Year

Fall

| | | |
|--------------------------------------|--|-----|
| CHEM 305 | Computer Applications in Chemistry | 1 |
| | GE B4 | |
| CHEM 371 | Physical Chemistry I | 3 |
| CHEM 372 | Physical Chemistry Laboratory | 1 |
| Chemistry Elective..... | | 3-4 |
| General Education and Electives..... | | 6-7 |

Spring

| | |
|--------------------------------------|----|
| Chemistry Elective..... | 4 |
| General Education and Electives..... | 12 |

Fourth Year

Fall

| | |
|--|-----|
| Chemistry Elective or Independent Research | 3-4 |
| General Education and Electives..... | 12 |

Spring

| | |
|--|-----|
| CHEM 499 Chemistry Capstone..... | 2 |
| Chemistry Elective or Independent Research | 3-4 |
| General Education and Electives..... | 9 |

Bachelor of Arts Degree in Chemistry,
 Option in Subject Matter Preparation in
 Teaching Chemistry - (120 units)

Lower Division Requirements

Students must obtain a grade of C or better in these courses to

| | | |
|----------------|-----|--------------------|
| 3. <i>Math</i> | | |
| MATH | 150 | Calculus I4 |
| MATH | 151 | Calculus II4 |

| | | |
|-------------------------------------|-----|----------------------------------|
| 4. <i>Physics</i> | | |
| <i>Choose one of the following:</i> | | |
| PHYS | 100 | Introduction to Physics I4 |
| PHYS | 200 | General Physics I4 |

| | | |
|-------------------------------------|-----|-----------------------------------|
| <i>Choose one of the following:</i> | | |
| PHYS | 101 | Introduction to Physics II4 |
| PHYS | 201 | General Physics II4 |

| | | |
|-------------------------------------|-----|---|
| 5. <i>Astronomy</i> | | |
| <i>Choose one of the following:</i> | | |
| ASTR | 105 | Introduction to the Solar System (PHYS)4 |
| PHYS | 107 | The Stars and Beyond3 |

| | | |
|-------------------------|-----|-------------------------|
| 6. <i>Earth Science</i> | | |
| GEOL | 121 | Physical Geology4 |

Upper Division Requirements

24 - 25 units

| | | |
|---------------------|-----|--|
| 1. <i>Chemistry</i> | | |
| CHEM | 305 | Computer Applications in Chemistry1 |
| CHEM | 311 | Organic Chemistry I.....3 |
| CHEM | 312 | Organic Chemistry I Laboratory1 |
| CHEM | 314 | Organic Chemistry II3 |
| CHEM | 315 | Organic Chemistry II Laboratory1 |
| CHEM | 330 | The History of Science: Non-Western Origins and the Western Revolution (HIST) 3 ¹ |
| CHEM | 371 | Physical Chemistry I3 |
| CHEM | 372 | Physical Chemistry Laboratory1 |
| CHEM | 499 | Chemistry Capstone.....2 |

| | | |
|-------------------------------------|-----|-------------------------------------|
| 2. <i>Earth Science</i> | | |
| <i>Choose one of the following:</i> | | |
| BIOL | 335 | The Biosphere3 |
| GEOL | 300 | Foundations of Earth Science4 |

apply them to the chemistry major.

43 - 44 units

| | | |
|---------------------|-----|--|
| 1. <i>Chemistry</i> | | |
| CHEM | 121 | General Chemistry I 4 |
| CHEM | 122 | General Chemistry II 4 |
| CHEM | 250 | Quantitative Analysis 3 |
| CHEM | 251 | Quantitative Analysis Laboratory 1 |

| | | |
|-------------------|-----|--|
| 2. <i>Biology</i> | | |
| BIOL | 200 | Principles of Organismal and Population Biology 4 |
| BIOL | 201 | Principles of Cell and Molecular Biology 4 |

| | | |
|----------------|-----|---------------------|
| 3. <i>Math</i> | | |
| MATH | 150 | Calculus I 4 |
| MATH | 151 | Calculus II 4 |

| | | |
|-------------------------------------|-----|-----------------------------------|
| 4. <i>Physics</i> | | |
| <i>Choose one of the following:</i> | | |
| PHYS | 100 | Introduction to Physics I 4 |
| PHYS | 200 | General Physics I 4 |

| | | |
|-------------------------------------|-----|------------------------------------|
| <i>Choose one of the following:</i> | | |
| PHYS | 101 | Introduction to Physics II 4 |
| PHYS | 201 | General Physics II 4 |

| | | |
|-------------------------------------|-----|---|
| 5. <i>Astronomy</i> | | |
| <i>Choose one of the following:</i> | | |
| ASTR | 105 | Introduction to the Solar System (PHYS).... 4 |
| PHYS | 107 | The Stars and Beyond 3 |

| | | |
|-------------------------|-----|--------------------------|
| 6. <i>Earth Science</i> | | |
| GEOL | 121 | Physical Geology 4 |

Upper Division Requirements

24 - 25 units

Students must obtain a grade of C or better in these courses to

3. Education

EDUC 330 Introduction to Secondary Schooling3

Upper Division Chemistry Electives

8 units

A total of eight units of electives from those listed below are needed, lab courses are denoted ^L.

| | | |
|----------|---|--------------------|
| CHEM 301 | Environmental Chemistry - Atmosphere and Climate | 3 |
| CHEM 302 | Environmental Chemistry - Soil and Water..... | 4 ^L |
| CHEM 313 | Organic Chemistry I Learning Community | 1 |
| CHEM 316 | Organic Chemistry II Learning Community | 1 |
| CHEM 373 | Physical Chemistry II | 3 |
| CHEM 410 | Advanced Organic Synthesis..... | 4 ^L |
| CHEM 415 | Molecular Structure Determination..... | 4 ^L |
| CHEM 420 | Advanced Inorganic Chemistry..... | 3 |
| CHEM 450 | Instrumental Analysis and Laboratory | 4 ^L |
| CHEM 460 | Biochemistry I..... | 4 ^L |
| CHEM 461 | Biochemistry II | 4 ^L |
| CHEM 465 | Bioinorganic Chemistry..... | 4 ^L |
| CHEM 490 | Special Topics in Chemistry | 1-3 |
| CHEM 492 | Internship/ Service Learning..... | 1-3 ^{L,R} |
| CHEM 494 | Independent Research..... | 1-3 ^{L,R} |
| CHEM 497 | Directed Studies | 1-3 ^R |

^R No more than a combined total of six units of CHEM 492, 494, and 497 may be applied as electives. No more than one CHEM 492 or CHEM 494 may be (by petition) considered a laboratory elective.

Required Supporting and Other GE Courses

39 units

| | |
|---|-----|
| American Institutions Requirement..... | 6 |
| Other Courses in GE Categories A-E..... | 33 |
| Electives in Any Discipline..... | 4-6 |

apply them to the chemistry major.

1. Chemistry

| | | |
|----------|---|----------------|
| CHEM 305 | Computer Applications in Chemistry | 1 |
| CHEM 311 | Organic Chemistry I..... | 3 |
| CHEM 312 | Organic Chemistry I Laboratory | 1 |
| CHEM 314 | Organic Chemistry II..... | 3 |
| CHEM 315 | Organic Chemistry II Laboratory..... | 1 |
| CHEM 330 | The History of Science: Non-Western Origins and the Western Revolution (HIST) | 3 ¹ |
| CHEM 371 | Physical Chemistry I | 3 |
| CHEM 372 | Physical Chemistry Laboratory | 1 |
| CHEM 499 | Chemistry Capstone | 2 |

2. Earth Science

Choose one of the following:

| | | |
|----------|------------------------------------|---|
| BIOL 335 | The Biosphere..... | 3 |
| GEOL 300 | Foundations of Earth Science | 4 |

3. Education

EDUC 330 Introduction to Secondary Schooling..... 3

Upper Division Chemistry Electives

8 units

A total of eight units of electives from those listed below are needed, lab courses are denoted ^L. Students must obtain a grade of C or better in these courses to apply them to the chemistry major.

| | | |
|----------|---|----------------|
| CHEM 301 | Environmental Chemistry - Atmosphere and Climate | 3 |
| CHEM 302 | Environmental Chemistry - Soil and Water | 4 ^L |
| CHEM 313 | Organic Chemistry I Learning Community | 1 |
| CHEM 316 | Organic Chemistry II Learning Community | 1 |
| CHEM 373 | Physical Chemistry II | 3 |

Recommended Electives

Choose from the following:

Second Language

(One semester is required)

One Additional Semester of a Second Language.....3

Interdisciplinary General Education Courses

(CHEM 330 and EDUC 330 are required)

SPED 345 Individuals with Disabilities
in Society (PSY)3

Prerequisite Courses in Education

(For CSUCI Credential Program)

EDUC 512 Equity, Diversity and Foundations
of Schooling3
EDUC 520 Observing and Guiding Behavior in
Multicultural/Multilingual and Inclusive
Classrooms3
EDUC 521 Field Experiences1
EDSS 515 Adolescent Development for
Secondary Educators3
ENGL 475 Language in Social Context3

Proposed Course of Study, Bachelor of Arts in Chemistry Option in Subject Matter Preparation in Teaching Chemistry

First Year

Fall

CHEM 121 General Chemistry I4
GE B1
MATH 150 Calculus I4
GE B3
BIOL 200 Principles of Organismal &
Population Biology4
GE B2
General Education3

CHEM 410 Advanced Organic Synthesis4^L
CHEM 415 Molecular Structure Determination4^L
CHEM 420 Advanced Inorganic Chemistry3
CHEM 450 Instrumental Analysis and Laboratory4^L
CHEM 460 Biochemistry I4^L
CHEM 461 Biochemistry II4^L
CHEM 465 Bioinorganic Chemistry4^L
CHEM 490 Special Topics in Chemistry1-3
CHEM 491 Special Laboratory Topics in Chemistry 1-3^L
CHEM 492 Internship/ Service Learning1-3^{L,R}
CHEM 494 Independent Research1-3^{L,R}
CHEM 497 Directed Studies1-3^R

^R No more than a combined total of six units of CHEM 492, 494, and 497 may be applied as electives. No more than one of CHEM 492 or CHEM 494 may be (by petition) considered a laboratory elective.

Required Supporting and Other GE Courses

39 units

American Institutions Requirement6
Other Courses in GE Categories A-E33
Electives in Any Discipline4-6

Recommended Electives

Choose from the following:

Second Language

(One semester is required)

One Additional Semester of a Second Language3

Interdisciplinary General Education Courses

(CHEM 330 and EDUC 330 are required)

SPED 345 Individuals with Disabilities
in Society (PSY)3

According to the GE requirements, students must take nine units from those interdisciplinary courses numbered 330-349 and 430-449. Six of the nine units can be double counted and three of the nine units must be outside the major and not crosslisted with the CHEM prefix.

| | | | | | | | |
|--------------------------------------|-----|---|----|---|-----|---|---|
| <i>Spring</i> | | | | Prerequisite Courses in Education | | | |
| CHEM | 122 | General Chemistry II | 4 | <i>(For CSUCI Credential Program)</i> | | | |
| BIOL | 201 | Principles of Cell & Molecular Biology..... | 4 | EDUC | 512 | Equity, Diversity and Foundations of Schooling | 3 |
| MATH | 151 | Calculus II | 4 | EDUC | 520 | Observing and Guiding Behavior in Multicultural/Multilingual and Inclusive Classrooms | 3 |
| General Education..... | | 3 | | EDUC | 521 | Field Experiences | 1 |
| Second Year | | | | EDSS | 515 | Adolescent Development for Secondary Educators | 3 |
| <i>Fall</i> | | | | ENGL | 475 | Language in Social Context | 3 |
| CHEM | 311 | Organic Chemistry I | 3 | Proposed Course of Study, Bachelor of Arts in Chemistry Option in Subject Matter Preparation in Teaching Chemistry | | | |
| CHEM | 312 | Organic Chemistry I Laboratory | 1 | First Year | | | |
| Physics requirement | | 4 | | <i>Fall</i> | | | |
| (PHYS 100 or 200) | | | | CHEM | 121 | General Chemistry I | 4 |
| General Education..... | | 6-7 | | GE B1 | | | |
| <i>Spring</i> | | | | MATH | 150 | Calculus I | 4 |
| CHEM | 250 | Quantitative Analysis..... | 2 | GE B3 | | | |
| CHEM | 251 | Quantitative Analysis Laboratory..... | 2 | BIOL | 200 | Principles of Organismal & Population Biology..... | 4 |
| CHEM | 314 | Organic Chemistry II | 3 | GE B2 | | | |
| CHEM | 315 | Organic Chemistry II Laboratory | 1 | General Education | | 3 | |
| Physics requirement | | 4 | | <i>Spring</i> | | | |
| (PHYS 101 or 201) | | | | CHEM | 122 | General Chemistry II | 4 |
| General Education..... | | 3 | | BIOL | 201 | Principles of Cell & Molecular Biology | 4 |
| Third Year | | | | MATH | 151 | Calculus II | 4 |
| <i>Fall</i> | | | | General Education | | 3 | |
| CHEM | 305 | Computer Applications in Chemistry..... | 1 | | | | |
| GE B4 | | | | | | | |
| CHEM | 371 | Physical Chemistry I | 3 | | | | |
| CHEM | 372 | Physical Chemistry Laboratory | 1 | | | | |
| EDUC | 330 | Introduction to Secondary Schooling | 3 | | | | |
| GE D, INTD | | | | | | | |
| GEOL | 121 | Physical Geology | 4 | | | | |
| General Educationand Electives | | 3 | | | | | |
| <i>Spring</i> | | | | | | | |
| CHEM | 330 | The History of Science: Non-Western Origins and the Western Revolution (HIST) | 3; | | | | |
| INTD | | | | | | | |
| SPED | 345 | Individuals with Disabilities | | | | | |

| | |
|---|---|
| <p>in Society (PSY)3; GE D or E, INTD</p> <p>General Education and Electives6</p> <p><i>Choose one of the following:</i></p> <p>BIOL 335 The Biosphere3 GEOL 300 Foundations of Earth Science4</p> <p>Fourth Year</p> <p><i>Fall</i></p> <p>Chemistry Elective or Independent Research..... 3-4 General Education and Electives12</p> <p><i>Spring</i></p> <p>CHEM 499 Chemistry Capstone.....2 Chemistry Elective or Independent Research..... 3-4 General Education and Electives9</p> | <p>General Education6-7</p> <p><i>Spring</i></p> <p>CHEM 250 Quantitative Analysis 3 CHEM 251 Quantitative Analysis Laboratory 1 CHEM 314 Organic Chemistry II..... 3 CHEM 315 Organic Chemistry II Laboratory..... 1 Physics requirement 4 (PHYS 101 or 201) General Education 3</p> <p>Third Year</p> <p><i>Fall</i></p> <p>CHEM 305 Computer Applications in Chemistry 1 GE B4 CHEM 371 Physical Chemistry I 3 CHEM 372 Physical Chemistry Laboratory 1 EDUC 330 Introduction to Secondary Schooling 3 GE D, INTD GEOL 121 Physical Geology 4 General Educationand Electives..... 3</p> <p><i>Spring</i></p> <p>CHEM 330 The History of Science: Non-Western Origins and the Western Revolution (HIST) 3; INTD SPED 345 Individuals with Disabilities in Society (PSY) 3; GE D or E, INTD General Education and Electives..... 6</p> <p><i>Choose one of the following:</i></p> <p>BIOL 335 The Biosphere 3 GEOL 300 Foundations of Earth Science 4</p> <p>Fourth Year</p> <p><i>Fall</i></p> <p>Chemistry Elective or Independent Research3-4 General Education and Electives..... 12</p> |
| <p>Bachelor of Science Degree in Chemistry - (120 units)</p> | |
| <p>Lower Division</p> | |
| <p>Requirements - 28 Units</p> <p>1. <i>Chemistry</i></p> <p>CHEM 121 General Chemistry I4 CHEM 122 General Chemistry II4 CHEM 250 Quantitative Analysis.....2 CHEM 251 Quantitative Analysis Laboratory.....2</p> <p>2. <i>Math</i></p> <p>MATH 150 Calculus I4 MATH 151 Calculus II4</p> <p>3. <i>Physics</i></p> <p><i>Choose one of the following:</i></p> <p>PHYS 100 Introduction to Physics I.....4</p> | |

PHYS 200 General Physics I4

Choose one of the following:

PHYS 101 Introduction to Physics II.....4

PHYS 201 General Physics II.....4

Upper Division Requirements - 22 units

CHEM 305 Computer Applications in Chemistry1

CHEM 311 Organic Chemistry I.....3

CHEM 312 Organic Chemistry I Laboratory1

CHEM 314 Organic Chemistry II3

CHEM 315 Organic Chemistry II Laboratory1

CHEM 371 Physical Chemistry I.....3

CHEM 372 Physical Chemistry Laboratory1

CHEM 373 Physical Chemistry II3

CHEM 460 Biochemistry I.....4

CHEM 499 Chemistry Capstone.....2

(Nine units of the above courses will be counted toward lower-division GE Categories B1, B3, and B4)

Upper Division Chemistry Electives

20 units

A total of twenty units of electives from those listed below are needed, including a minimum of three lab courses denoted ¹:

CHEM 301 Environmental Chemistry -
Atmosphere and Climate3

CHEM 302 Environmental Chemistry -
Soil and Water.....4

CHEM 313 Organic Chemistry I Learning
Community1

CHEM 316 Organic Chemistry II Learning
Community1

CHEM 330 The History of Science: Non-Western
Origins and the Western Revolution
(HIST)3 ¹

Spring

CHEM 499 Chemistry Capstone 2

Chemistry Elective or Independent Research3-4

General Education and Electives..... 9

Bachelor of Science Degree in Chemistry - (120 units)

Lower Division

Requirements - 28 Units

Students must obtain a grade of C or better in these courses to apply them to the chemistry major.

1. Chemistry

CHEM 121 General Chemistry I 4

CHEM 122 General Chemistry II 4

CHEM 250 Quantitative Analysis 3

CHEM 251 Quantitative Analysis Laboratory 1

2. Math

MATH 150 Calculus I 4

MATH 151 Calculus II 4

3. Physics

Choose one of the following:

PHYS 100 Introduction to Physics I..... 4

PHYS 200 General Physics I..... 4

Choose one of the following:

PHYS 101 Introduction to Physics II 4

PHYS 201 General Physics II..... 4

Upper Division Requirements - 22 units

Students must obtain a grade of C or better in these courses to

| | | |
|----------|--|--------------------|
| CHEM 335 | The Chemistry of the Kitchen | 3 ^{L1} |
| CHEM 341 | Drug Discovery and Development (BUS/ECON) | 3 ^I |
| CHEM 343 | Forensic Science | 3 ^{L1} |
| CHEM 344 | Energy and Society | 3 ^I |
| CHEM 410 | Advanced Organic Synthesis | 4 ^L |
| CHEM 415 | Molecular Structure Determination | 4 ^L |
| CHEM 420 | Advanced Inorganic Chemistry | 3 |
| CHEM 450 | Instrumental Analysis and Laboratory | 4 ^L |
| CHEM 461 | Biochemistry II | 4 ^L |
| CHEM 465 | Bioinorganic Chemistry | 4 ^L |
| CHEM 490 | Special Topics in Chemistry | 1-3 |
| CHEM 492 | Internship/ Service Learning..... | 1-3 ^{L,R} |
| CHEM 494 | Independent Research..... | 1-3 ^{L,R} |
| CHEM 497 | Directed Studies | 1-3 ^R |

¹ A maximum of three units of upper-division interdisciplinary GE credit (CHEM 330-349 or CHEM 430-449) may be applied as chemistry electives towards the degree.

^R No more than a combined total of six units of CHEM 492,, 494, and 497 may be applied as electives. No more than one CHEM 492 or CHEM 494 may be (by petition) considered a laboratory elective.

Required Supporting and Other GE Courses

45 units

| | |
|---|----|
| American Institutions Requirement..... | 6 |
| Other Courses in GE Categories A-E..... | 39 |
| Electives in Any Discipline..... | 5 |

Proposed Course of Study

Bachelor of Science in Chemistry

First Year

Fall

| | | |
|------------------------|---------------------------|-----|
| CHEM 121 | General Chemistry I | 4 |
| | GE B1 | |
| MATH 150 | Calculus I | 4 |
| | GE B3 | |
| General Education..... | | 6-7 |

apply them to the chemistry major.

| | | |
|----------|--|---|
| CHEM 305 | Computer Applications in Chemistry | 1 |
| CHEM 311 | Organic Chemistry I..... | 3 |
| CHEM 312 | Organic Chemistry I Laboratory | 1 |
| CHEM 314 | Organic Chemistry II..... | 3 |
| CHEM 315 | Organic Chemistry II Laboratory | 1 |
| CHEM 371 | Physical Chemistry I | 3 |
| CHEM 372 | Physical Chemistry Laboratory..... | 1 |
| CHEM 373 | Physical Chemistry II | 3 |
| CHEM 460 | Biochemistry I | 4 |
| CHEM 499 | Chemistry Capstone | 2 |

(Nine units of the above courses will be counted toward lower-division GE Categories B1, B3, and B4)

Upper Division Chemistry Electives

20 units

Students must obtain a grade of C or better in these courses to apply them to the chemistry major.

A total of twenty units of electives from those listed below are needed, including a minimum of three lab courses

denoted^L:

| | | |
|----------|---|-----------------|
| CHEM 301 | Environmental Chemistry - Atmosphere and Climate..... | 3 |
| CHEM 302 | Environmental Chemistry - Soil and Water | 4 ^L |
| CHEM 313 | Organic Chemistry I Learning Community | 1 |
| CHEM 316 | Organic Chemistry II Learning Community | 1 |
| CHEM 330 | The History of Science: Non-Western Origins and the Western Revolution (HIST) | 3 ^I |
| CHEM 335 | The Chemistry of the Kitchen | 3 ^{L1} |
| CHEM 341 | Drug Discovery and Development | |

Spring

| | | |
|------------------------|---------------------------|-----|
| CHEM 122 | General Chemistry II..... | 4 |
| MATH 151 | Calculus II..... | 4 |
| General Education..... | | 6-7 |

Second Year

Fall

| | | |
|--------------------------|-------------------------------------|-----|
| CHEM 311 | Organic Chemistry I..... | 3 |
| CHEM 312 | Organic Chemistry I Laboratory..... | 1 |
| Physics requirement..... | | 4 |
| (PHYS 100 or 200) | | |
| General Education..... | | 6-7 |

Spring

| | | |
|--------------------------|---------------------------------------|---|
| CHEM 250 | Quantitative Analysis..... | 2 |
| CHEM 251 | Quantitative Analysis Laboratory..... | 2 |
| CHEM 314 | Organic Chemistry II..... | 3 |
| CHEM 315 | Organic Chemistry II Laboratory..... | 1 |
| Physics requirement..... | | 4 |
| (PHYS 101 or 201) | | |
| General Education..... | | 3 |

Third Year

Fall

| | | |
|--------------------------------------|---|-----|
| CHEM 305 | Computer Applications in Chemistry..... | 1 |
| GE B4 | | |
| CHEM 371 | Physical Chemistry I..... | 3 |
| CHEM 372 | Physical Chemistry Laboratory..... | 1 |
| Chemistry Elective..... | | 3-4 |
| General Education and Electives..... | | 6 |

Spring

| | | |
|--------------------------------------|----------------------------|-----|
| CHEM 373 | Physical Chemistry II..... | 3 |
| Chemistry Elective..... | | 3-4 |
| General Education and Electives..... | | 6 |

Fourth Year

Fall

| | | |
|----------|---------------------|---|
| CHEM 460 | Biochemistry I..... | 4 |
|----------|---------------------|---|

| | | |
|----------|---|--------------------|
| | (BUS/ECON)..... | 3 ¹ |
| CHEM 343 | Forensic Science..... | 3 ^{L,1} |
| CHEM 344 | Energy and Society (PHYS)..... | 3 ¹ |
| CHEM 410 | Advanced Organic Synthesis..... | 4 ^L |
| CHEM 415 | Molecular Structure Determination..... | 4 ^L |
| CHEM 420 | Advanced Inorganic Chemistry..... | 3 |
| CHEM 450 | Instrumental Analysis and Laboratory..... | 4 ^L |
| CHEM 461 | Biochemistry II..... | 4 ^L |
| CHEM 465 | Bioinorganic Chemistry..... | 4 ^L |
| CHEM 490 | Special Topics in Chemistry..... | 1-3 |
| CHEM 491 | Special Laboratory Topics in Chemistry 1-3..... | 1-3 ^L |
| CHEM 492 | Internship/ Service Learning..... | 1-3 ^{L,R} |
| CHEM 494 | Independent Research..... | 1-3 ^{L,R} |
| CHEM 497 | Directed Studies..... | 1-3 ^R |

¹ A maximum of three units of upper-division interdisciplinary GE credit (CHEM 330-349 or CHEM 430-449) may be applied as chemistry electives towards the degree.

^R No more than a combined total of six units of CHEM 492, 494, and 497 may be applied as electives. No more than one of CHEM 492 or CHEM 494 may be (by petition) considered a laboratory elective.

Required Supporting and Other GE Courses

45 units

| | |
|---|----|
| American Institutions Requirement..... | 6 |
| Other Courses in GE Categories A-E..... | 39 |
| Electives in Any Discipline..... | 5 |

Proposed Course of Study

Bachelor of Science in Chemistry

First Year

Fall

| | | |
|------------------------|--------------------------|-----|
| CHEM 121 | General Chemistry I..... | 4 |
| GE B1 | | |
| MATH 150 | Calculus I..... | 4 |
| GE B3 | | |
| General Education..... | | 6-7 |

| | |
|---|-----|
| Chemistry Elective or Independent Research..... | 3-4 |
| General Education and Electives | 6-7 |

Spring

| | |
|---|-----|
| CHEM 499 Chemistry Capstone..... | 2 |
| Chemistry Elective | 3-4 |
| Chemistry Elective or Independent Research..... | 3-4 |
| General Education and Electives | 6 |

**Bachelor of Science Degree
in Chemistry, Biochemistry Option
(120 units)**

Lower Division Requirements - 36 units

1. *Chemistry*

| | |
|--|---|
| CHEM 121 General Chemistry I..... | 4 |
| CHEM 122 General Chemistry II..... | 4 |
| CHEM 250 Quantitative Analysis..... | 2 |
| CHEM 251 Quantitative Analysis Laboratory..... | 2 |

2. *Biology*

| | |
|---|---|
| BIOL 200 Principles of Organismal and Population Biology | 4 |
| BIOL 201 Principles of Cell & Molecular Biology..... | 4 |

3. *Math*

| | |
|----------------------------|---|
| MATH 150 Calculus I | 4 |
| MATH 151 Calculus II | 4 |

4. *Physics*

Choose one of the following:

| | |
|---|---|
| PHYS 100 Introduction to Physics I..... | 4 |
| PHYS 200 General Physics I | 4 |

Choose one of the following:

Spring

| | |
|------------------------------------|-----|
| CHEM 122 General Chemistry II..... | 4 |
| MATH 151 Calculus II..... | 4 |
| General Education | 6-7 |

Second Year

Fall

| | |
|---|-----|
| CHEM 311 Organic Chemistry I..... | 3 |
| CHEM 312 Organic Chemistry I Laboratory | 1 |
| Physics requirement..... | 4 |
| (PHYS 100 or 200) | |
| General Education | 6-7 |

Spring

| | |
|---|---|
| CHEM 250 Quantitative Analysis | 3 |
| CHEM 251 Quantitative Analysis Laboratory | 1 |
| CHEM 314 Organic Chemistry II | 3 |
| CHEM 315 Organic Chemistry II Laboratory..... | 1 |
| Physics requirement | 4 |
| (PHYS 101 or 201) | |
| General Education | 3 |

Third Year

Fall

| | |
|---|-----|
| CHEM 305 Computer Applications in Chemistry | 1 |
| GE B4 | |
| CHEM 371 Physical Chemistry I | 3 |
| CHEM 372 Physical Chemistry Laboratory..... | 1 |
| Chemistry Elective..... | 3-4 |
| General Education and Electives..... | 6 |

Spring

| | |
|--------------------------------------|-----|
| CHEM 373 Physical Chemistry II..... | 3 |
| Chemistry Elective..... | 3-4 |
| General Education and Electives..... | 6 |

Fourth Year

Fall

| | |
|--|-----|
| CHEM 460 Biochemistry I | 4 |
| Chemistry Elective or Independent Research | 3-4 |

| | | | |
|------|-----|---------------------------------|---|
| PHYS | 101 | Introduction to Physics II..... | 4 |
| PHYS | 201 | General Physics II..... | 4 |

Upper Division Requirements - 31 units

1. Chemistry

| | | | |
|------|-----|---|---|
| CHEM | 305 | Computer Applications in Chemistry..... | 1 |
| CHEM | 311 | Organic Chemistry I..... | 3 |
| CHEM | 312 | Organic Chemistry I Laboratory | 1 |
| CHEM | 314 | Organic Chemistry II | 3 |
| CHEM | 315 | Organic Chemistry II Laboratory | 1 |
| CHEM | 371 | Physical Chemistry I..... | 3 |
| CHEM | 372 | Physical Chemistry Laboratory | 1 |
| CHEM | 460 | Biochemistry I..... | 4 |
| CHEM | 461 | Biochemistry II | 4 |
| CHEM | 499 | Chemistry Capstone..... | 2 |

2. Biology

| | | | |
|------|-----|-------------------------|---|
| BIOL | 300 | Cell Biology | 4 |
| BIOL | 400 | Molecular Biology | 4 |

(Twelve units of the above requirements will be counted toward lower-division GE Categories B1, B2, B3, & B4)

Upper Division Chemistry Electives

3 units

A total of three units of electives from those listed below are needed. Lab courses are denoted ^L.

| | | | |
|------|-----|---|---|
| CHEM | 301 | Environmental Chemistry - Atmosphere and Climate | 3 |
| CHEM | 302 | Environmental Chemistry - Soil and Water..... | 4 |
| CHEM | 313 | Organic Chemistry I Learning Community | 1 |
| CHEM | 316 | Organic Chemistry II Learning Community..... | 1 |
| CHEM | 330 | The History of Science: Non-Western Origins and the Western Revolution | |

General Education and Electives..... 6-7

Spring

| | | | |
|------|-----|--|-----|
| CHEM | 499 | Chemistry Capstone | 2 |
| | | Chemistry Elective..... | 3-4 |
| | | Chemistry Elective or Independent Research | 3-4 |
| | | General Education and Electives..... | 6 |

Bachelor of Science Degree in Chemistry, Biochemistry Option (120 units)

Lower Division Requirements - 36 units

Students must obtain a grade of C or better in these courses to apply them to the chemistry major.

1. Chemistry

| | | | |
|------|-----|--|---|
| CHEM | 121 | General Chemistry I | 4 |
| CHEM | 122 | General Chemistry II | 4 |
| CHEM | 250 | Quantitative Analysis | 3 |
| CHEM | 251 | Quantitative Analysis Laboratory | 1 |

2. Biology

| | | | |
|------|-----|--|---|
| BIOL | 200 | Principles of Organismal and Population Biology | 4 |
| BIOL | 201 | Principles of Cell & Molecular Biology | 4 |

3. Math

| | | | |
|------|-----|-------------------|---|
| MATH | 150 | Calculus I | 4 |
| MATH | 151 | Calculus II | 4 |

4. Physics

Choose one of the following:

| | | | |
|------|-----|--------------------------------|---|
| PHYS | 100 | Introduction to Physics I..... | 4 |
|------|-----|--------------------------------|---|

| | | |
|----------|--|--------------------|
| | (HIST) | 3 ¹ |
| CHEM 335 | The Chemistry of the Kitchen | 3 ¹ |
| CHEM 341 | Drug Discovery and Development (BUS/ECON) | 3 ¹ |
| CHEM 343 | Forensic Science | 3 ^{L,1} |
| CHEM 344 | Energy and Society | 3 ¹ |
| CHEM 373 | Physical Chemistry II | 3 |
| CHEM 410 | Advanced Organic Synthesis | 4 ^L |
| CHEM 415 | Molecular Structure Determination | 4 ^L |
| CHEM 420 | Advanced Inorganic Chemistry | 3 |
| CHEM 450 | Instrumental Analysis and Laboratory | 4 ^L |
| CHEM 465 | Bioinorganic Chemistry | 4 ^L |
| CHEM 490 | Special Topics in Chemistry | 1-3 |
| CHEM 492 | Internship/ Service Learning | 1-3 ^{L,R} |
| CHEM 494 | Independent Research | 1-3 ^{L,R} |
| CHEM 497 | Directed Studies | 1-3 ^R |

¹ Upper-division interdisciplinary GE credit (CHEM 330- 349 or CHEM 430-449) may be applied as chemistry electives towards the degree.

^R No more than a combined total of six units of CHEM 492, 494, and 497 may be applied as electives. No more than one CHEM 492 or CHEM 494 may be (by petition) considered a laboratory elective.

Required Supporting and Other GE Courses

42 units

| | |
|--|----|
| American Institutions Requiremen | 6 |
| Other Courses in GE Categories A-E | 36 |
| Electives in Any Discipline | 5 |

Proposed Course of Study

Bachelor of Science in Chemistry, Biochemistry Option

First Year

Fall

| | | |
|----------|---------------------------|---|
| CHEM 121 | General Chemistry I | 4 |
| | GE B1 | |
| MATH 150 | Calculus I | 4 |

| | | |
|----------|-------------------------|---|
| PHYS 200 | General Physics I | 4 |
|----------|-------------------------|---|

Choose one of the following:

| | | |
|----------|----------------------------------|---|
| PHYS 101 | Introduction to Physics II | 4 |
| PHYS 201 | General Physics II | 4 |

Upper Division Requirements - 31 units

Students must obtain a grade of C or better in these courses to apply them to the chemistry major.

1. Chemistry

| | | |
|----------|--|---|
| CHEM 305 | Computer Applications in Chemistry | 1 |
| CHEM 311 | Organic Chemistry I | 3 |
| CHEM 312 | Organic Chemistry I Laboratory | 1 |
| CHEM 314 | Organic Chemistry II | 3 |
| CHEM 315 | Organic Chemistry II Laboratory | 1 |
| CHEM 371 | Physical Chemistry I | 3 |
| CHEM 372 | Physical Chemistry Laboratory | 1 |
| CHEM 460 | Biochemistry I | 4 |
| CHEM 461 | Biochemistry II | 4 |
| CHEM 499 | Chemistry Capstone | 2 |

2. Biology

| | | |
|----------|-------------------------|---|
| BIOL 300 | Cell Biology | 4 |
| BIOL 400 | Molecular Biology | 4 |

(Twelve units of the above requirements will be counted toward lower-division GE Categories B1, B2, B3, & B4)

Upper Division Chemistry Electives

3 units

Students must obtain a grade of C or better in these courses to apply them to the chemistry major.

A total of three units of electives from those listed below are needed. Lab courses are denoted ^L.

| | | | | |
|--|---|--------------------|--|--|
| BIOL 200 | GE B3 Principles of Organismal and Population Biology | 4 | | |
| | GE B2 General Education | 3 | | |
| <i>Spring</i> | | | | |
| BIOL 201 | Principles of Cell and Molecular Biology | 4 | | |
| CHEM 122 | General Chemistry II | 4 | | |
| MATH 151 | Calculus II | 4 | | |
| | General Education | 3 | | |
| Second Year | | | | |
| <i>Fall</i> | | | | |
| CHEM 311 | Organic Chemistry I | 3 | | |
| CHEM 312 | Organic Chemistry I Laboratory | 1 | | |
| | Physics requirement | 4 | | |
| | (PHYS 100 or 200) | | | |
| | General Education | 6-7 | | |
| <i>Spring</i> | | | | |
| CHEM 250 | Quantitative Analysis | 2 | | |
| CHEM 251 | Quantitative Analysis Laboratory | 2 | | |
| CHEM 314 | Organic Chemistry II | 3 | | |
| CHEM 315 | Organic Chemistry II Laboratory | 1 | | |
| | Physics requirement (PHYS 101 or 201) | 4 | | |
| | General Education | 3 | | |
| Third Year | | | | |
| <i>Fall</i> | | | | |
| CHEM 305 | Computer Applications in Chemistry | 1 | | |
| | GE B4 | | | |
| CHEM 371 | Physical Chemistry I | 3 | | |
| CHEM 372 | Physical Chemistry Laboratory | 1 | | |
| BIOL 300 | Cell Biology | 4 | | |
| | General Education or Electives | 6 | | |
| <i>Spring - 14 units</i> | | | | |
| | Chemistry Elective | 3-4 | | |
| CHEM 301 | Environmental Chemistry - Atmosphere and Climate | 3 | | |
| CHEM 302 | Environmental Chemistry - Soil and Water | 4 ^L | | |
| CHEM 313 | Organic Chemistry I Learning Community | 1 | | |
| CHEM 316 | Organic Chemistry II Learning Community | 1 | | |
| CHEM 330 | The History of Science: Non-Western Origins and the Western Revolution (HIST) | 3 ¹ | | |
| CHEM 335 | The Chemistry of the Kitchen | 3 ¹ | | |
| CHEM 341 | Drug Discovery and Development (BUS/ECON) | 3 ¹ | | |
| CHEM 343 | Forensic Science | 3 ^{L,1} | | |
| CHEM 344 | Energy and Society (PHYS) | 3 ¹ | | |
| CHEM 373 | Physical Chemistry II | 3 | | |
| CHEM 410 | Advanced Organic Synthesis | 4 ^L | | |
| CHEM 415 | Molecular Structure Determination | 4 ^L | | |
| CHEM 420 | Advanced Inorganic Chemistry | 3 | | |
| CHEM 450 | Instrumental Analysis and Laboratory | 4 ^L | | |
| CHEM 465 | Bioinorganic Chemistry | 4 ^L | | |
| CHEM 490 | Special Topics in Chemistry | 1-3 | | |
| CHEM 491 | Special Laboratory Topics in Chemistry | 1-3 ^L | | |
| CHEM 492 | Internship/ Service Learning | 1-3 ^{L,R} | | |
| CHEM 494 | Independent Research | 1-3 ^{L,R} | | |
| CHEM 497 | Directed Studies | 1-3 ^R | | |
| ¹ Upper-division interdisciplinary GE credit (CHEM 330- 349 or CHEM 430-449) may be applied as chemistry electives towards the degree. | | | | |
| ^R No more than a combined total of six units of CHEM 492, 494, and 497 may be applied as electives. No more than one of CHEM 492 or CHEM 494 may be (by petition) considered a laboratory elective. | | | | |
| Required Supporting and Other GE Courses | | | | |
| 42 units | | | | |
| | American Institutions Requiremen..... | 6 | | |

| | | |
|-------------------------------------|-------------------------|-----|
| BIOL 400 | Molecular Biology | 4 |
| General Education or Electives..... | | 6-7 |

Fourth Year

Fall

| | | |
|---|---------------------|-----|
| CHEM 460 | Biochemistry I..... | 4 |
| Chemistry Elective or Independent Research..... | | 3-4 |
| General Education or Electives..... | | 6-7 |

Spring

| | | |
|-------------------------------------|-------------------------|---|
| CHEM 461 | Biochemistry II | 4 |
| CHEM 499 | Chemistry Capstone..... | 2 |
| General Education or Electives..... | | 9 |

Minor in Chemistry - (23 units)

Lower Division

Requirements - 8 units

| | | |
|----------|---|---|
| CHEM 121 | General Chemistry I and Laboratory | 4 |
| CHEM 122 | General Chemistry II and Laboratory | 4 |

Upper Division Requirements - 8 units

| | | |
|----------|---------------------------------------|---|
| CHEM 311 | Organic Chemistry I | 3 |
| CHEM 312 | Organic Chemistry I Laboratory | 1 |
| CHEM 314 | Organic Chemistry II..... | 3 |
| CHEM 315 | Organic Chemistry II Laboratory | 1 |

Electives - 7 units

A total of seven units of electives (CHEM 250, CHEM 251, or courses numbered 300 or higher) in addition to those required, are needed. A maximum of three units of upper-division interdisciplinary GE credit (CHEM 330-349 or CHEM 430-449) may be applied as chemistry electives towards the degree. One unit of Chemistry learning community courses (i.e., CHEM 313 and 316) may be used as electives toward the degree. No more than a combined total of six units of CHEM 492, 494, and 497 may be applied as electives.

| | |
|---|----|
| Other Courses in GE Categories A-E..... | 36 |
| Electives in Any Discipline | 5 |

Proposed Course of Study

Bachelor of Science in Chemistry, Biochemistry Option

First Year

Fall

| | | |
|-------------------------|--|---|
| CHEM 121 | General Chemistry I | 4 |
| GE B1 | | |
| MATH 150 | Calculus I | 4 |
| GE B3 | | |
| BIOL 200 | Principles of Organismal and Population Biology | 4 |
| GE B2 | | |
| General Education | | 3 |

Spring

| | | |
|-------------------------|--|---|
| BIOL 201 | Principles of Cell and Molecular Biology..... | 4 |
| CHEM 122 | General Chemistry II | 4 |
| MATH 151 | Calculus II | 4 |
| General Education | | 3 |

Second Year

Fall

| | | |
|---------------------------|--------------------------------------|-----|
| CHEM 311 | Organic Chemistry I | 3 |
| CHEM 312 | Organic Chemistry I Laboratory | 1 |
| Physics requirement | | 4 |
| (PHYS 100 or 200) | | |
| General Education..... | | 6-7 |

Spring

| | | |
|---|--|---|
| CHEM 250 | Quantitative Analysis | 3 |
| CHEM 251 | Quantitative Analysis Laboratory | 1 |
| CHEM 314 | Organic Chemistry II..... | 3 |
| CHEM 315 | Organic Chemistry II Laboratory..... | 1 |
| Physics requirement (PHYS 101 or 201) | | 4 |
| General Education | | 3 |

Certificate in Chemistry - (23 units)

Lower Division Requirements - 8 units

| | | |
|----------|---|---|
| CHEM 121 | General Chemistry I and Laboratory..... | 4 |
| CHEM 122 | General Chemistry II and Laboratory | 4 |

Upper Division Requirements - 8 units

| | | |
|----------|---------------------------------------|---|
| CHEM 311 | Organic Chemistry I | 3 |
| CHEM 312 | Organic Chemistry I Laboratory | 1 |
| CHEM 314 | Organic Chemistry II | 3 |
| CHEM 315 | Organic Chemistry II Laboratory | 1 |

Electives - 7 units

A total of seven units of electives (CHEM 250, CHEM 251, or courses numbered 300 or higher) in addition to those required, are needed. A maximum of three units of upper-division interdisciplinary GE credit (CHEM 330-349 or CHEM 430-449) may be applied as chemistry electives towards the degree. One unit of Chemistry learning community courses (i.e., CHEM 313 and 316) may be used as electives toward the degree. No more than a combined total of six units of CHEM 492, 494, and 497 may be applied as electives.

Third Year

Fall

| | | |
|----------|--|---|
| CHEM 305 | Computer Applications in Chemistry | 1 |
| | GE B4 | |
| CHEM 371 | Physical Chemistry I | 3 |
| CHEM 372 | Physical Chemistry Laboratory..... | 1 |
| BIOL 300 | Cell Biology..... | 4 |
| | General Education or Electives | 6 |

Spring - 14 units

| | | |
|----------|--------------------------------------|-----|
| | Chemistry Elective..... | 3-4 |
| BIOL 400 | Molecular Biology..... | 4 |
| | General Education or Electives | 6-7 |

Fourth Year

Fall

| | | |
|----------|--|-----|
| CHEM 460 | Biochemistry I | 4 |
| | Chemistry Elective or Independent Research | 3-4 |
| | General Education or Electives | 6-7 |

Spring

| | | |
|----------|--------------------------------------|---|
| CHEM 461 | Biochemistry II..... | 4 |
| CHEM 499 | Chemistry Capstone | 2 |
| | General Education or Electives | 9 |

Minor in Chemistry - (23 units)

Lower Division Requirements - 8 units

| | | |
|----------|---|---|
| CHEM 121 | General Chemistry I and Laboratory | 4 |
| CHEM 122 | General Chemistry II and Laboratory | 4 |

Upper Division Requirements - 8 units

| | | |
|----------|--------------------------------------|---|
| CHEM 311 | Organic Chemistry I | 3 |
| CHEM 312 | Organic Chemistry I Laboratory | 1 |
| CHEM 314 | Organic Chemistry II..... | 3 |

| | |
|--|---|
| | <p>CHEM 315 Organic Chemistry II Laboratory..... 1</p> <p>Electives - 7 units A total of seven units of electives (CHEM 250, CHEM 251, or courses numbered 300 or higher) in addition to those required, are needed. A maximum of three units of upper-division interdisciplinary GE credit (CHEM 330-349 or CHEM 430-449) may be applied as chemistry electives towards the degree. One unit of Chemistry learning community courses (i.e., CHEM 313 and 316) may be used as electives toward the degree. No more than a combined total of six units of CHEM 492, 494, and 497 may be applied as electives.</p> <div style="border: 1px solid black; padding: 10px; text-align: center; margin: 10px auto; width: fit-content;"> <p>Certificate in Chemistry - (23 units)</p> </div> <p>Lower Division Requirements - 8 units CHEM 121 General Chemistry I and Laboratory 4 CHEM 122 General Chemistry II and Laboratory 4</p> <p>Upper Division Requirements - 8 units CHEM 311 Organic Chemistry I 3 CHEM 312 Organic Chemistry I Laboratory 1 CHEM 314 Organic Chemistry II 3 CHEM 315 Organic Chemistry II Laboratory 1</p> <p>Electives - 7 units A total of seven units of electives (CHEM 250, CHEM 251, or courses numbered 300 or higher) in addition to those required, are needed. A maximum of three units of upper-division interdisciplinary GE credit (CHEM 330-349 or CHEM 430-449) may be applied as chemistry electives towards the degree. One unit of Chemistry learning community courses (i.e., CHEM 313 and 316) may be used as electives toward the degree. No more than a combined total of six units of CHEM 492, 494, and 497 may be applied as electives.</p> |
| | |

SUMMARY OF CHANGES

- 1) Students will be required to obtain grades of C or better in Lower and Upper Division Requirements, and in Chemistry Electives.

- 2) The words "Pending CCTC Approval" are removed from our Subject Matter Teaching Option. The option is not pending CCTC approval. What is pending CCTC approval is whether that option is a substitute for the subject matter exam in chemistry. Regardless of whether it will be or not, this is the option that best prepares student for teaching chemistry at the high school level.
- 3) We have added CHEM 491 as an elective.
- 4) There was a typo in CHEM 302 in both B.S. options.

JUSTIFICATION

- 1) We want our students to obtain passing grades (a C or better) in all chemistry courses, and other required major courses, in order to get a degree in chemistry.
- 2) The option is not pending CCTC approval. What is pending CCTC approval is whether that option is a substitute for the subject matter exam in chemistry. Regardless of whether it will be or not, this is the option that best prepares student for teaching chemistry at the high school level.
- 3) This course is being proposed and needs to be added as an elective.
- 4) CHEM 302 is a lab class and was not listed as such in either B.S. option.
- 5) Correct units of CHEM 250 AND 251
- 6) Clarify "R" footnote to be expressed in units

_Simone Aloisio_____ 10/27/2009_____
Proposer of Program Modification Date

Program: CHEMISTRY

| | | |
|---------------|--|--|
| Program Chair | | |
|---------------|--|--|

Signature

Date

| | | |
|------------------|--|--|
| Curriculum Chair | | |
|------------------|--|--|

Signature

Date

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| Dean of Faculty | | |
|-----------------|--|--|

Signature

Date