

California State University Channel Islands

## Program Update For Minor Program Updates Only

Program updates must be submitted by November 3, 2008 for priority catalog review

Date (Change if modified and update the file name with the new date): 2, 2.23.09

Program Area: CHEMISTRY

Semester/Year first affected: FALL 2009

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**Instructions:** Please use this Program Update form for minor changes to existing programs. Appropriate updates for this form include faculty or address changes, additions of approved electives, minor editing for clarity, and other minor updates. Any change to program requirements, units, outcomes, emphases or options, or other programmatic concerns require the standard two column Program Modification form, available at the Curriculum website.

### CURRENTLY APPROVED PROGRAM WITH CHANGES TRACKED

*Paste the latest approved version of your entire program in the below the line and before the Summary of Changes before you begin (If you are unsure about which version is the most recent, contact Kathy Musashi). If the form does not preset to the tracked changes mode, turn on tracked changes using Word Tools before making the necessary edits. Please set the view to ORIGINAL SHOWING MARKUP.*

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# CHEMISTRY

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## 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 Colloquium in conjunction with a service learning project, internship, or independent research experience. Writing skills are developed in all upper-division Chemistry courses.

## Careers

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.

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.

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.

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.

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.

## Program Learning Outcomes

Students graduating from the Chemistry program will be able to:

- Explain the fundamental concepts of Chemistry;

- Evaluate a microscopic and macroscopic (real-life) 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

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## Requirements for the Bachelor of Arts Degree in Chemistry (120 units)

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### Lower Division Requirements (28 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. 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<sup>+</sup>:

CHEM 301 Environmental Chemistry - Atmosphere and Climate (3)  
CHEM 302 Environmental Chemistry - Soil and Water (4)<sup>L</sup>  
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)<sup>I</sup>  
CHEM 335 The Chemistry of the Kitchen (3)<sup>I</sup>  
CHEM 341 Drug Discovery and Development (BUS/ECON) (3)<sup>I</sup>  
CHEM 343 Forensic Science (3)<sup>L, I</sup>  
CHEM 344 Energy and Society (3)<sup>I</sup>  
CHEM 373 Physical Chemistry II (3)  
CHEM 410 Advanced Organic Synthesis (4)<sup>L</sup>  
CHEM 415 Molecular Structure Determination (4)<sup>L</sup>  
CHEM 420 Advanced Inorganic Chemistry (3)  
CHEM 450 Instrumental Analysis and Laboratory (4)<sup>L</sup>  
CHEM 460 Biochemistry I (4)<sup>L</sup>  
CHEM 461 Biochemistry II (4)<sup>L</sup>  
CHEM 465 Bioinorganic Chemistry (4)<sup>L</sup>  
CHEM 490 Special Topics in Chemistry (1-3)  
CHEM 492 Internship/ Service Learning (1-3)<sup>L, R</sup>  
CHEM 494 Independent Research (1-3)<sup>L, R</sup>  
CHEM 497 Directed Studies (1-3)

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<sup>I</sup> 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.

<sup>R</sup> 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 units

## 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 Units)

**Spring**

CHEM 122 General Chemistry II (4)  
MATH 151 Calculus II (4)  
General Education (6-7 Units)

## 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 Units)

**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 Units)

## 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 Units)  
General Education and Electives (6-7 Units)

**Spring**

Chemistry Elective (4 Units)  
General Education and Electives (12 Units)

## Fourth Year

**Fall**

Chemistry Elective or Independent Research(3-4 Units)  
General Education and Electives (12 Units)

**Spring**

CHEM 499 Chemistry Capstone (2)  
Chemistry Elective or Independent Research (3-4 Units)  
General Education and Electives (9 Units)

Requirements for the Bachelor of Arts Degree in Chemistry,  
Option in Subject Matter Preparation in Teaching Chemistry  
(120 UNITS)  
(Pending CCTC Approval)

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## 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)

### 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:

PHYS	101	Introduction to Physics II (4)
PHYS	201	General Physics II (4)

### 5. Astronomy

Choose one of the following:

PHYS	105	Introduction to the Solar System (4)
PHYS	107	The Stars and Beyond (3)

### 6. Earth Science

GEOL	121	Physical Geology (4)
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## Upper Division Requirements (24-25 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	330	The History of Science: Non-Western Origins and the Western Revolution (HIST) (3) I
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)
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## Upper Division Chemistry Electives (8 units)

A total of eight units of electives from those listed below are needed, lab courses are denoted<sup>L</sup>.

CHEM 301	Environmental Chemistry - Atmosphere and Climate (3)
CHEM 302	Environmental Chemistry - Soil and Water (4) <sup>L</sup>
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) <sup>L</sup>
CHEM 415	Molecular Structure Determination (4) <sup>L</sup>
CHEM 420	Advanced Inorganic Chemistry (3)
CHEM 450	Instrumental Analysis and Laboratory (4) <sup>L</sup>
CHEM 460	Biochemistry I (4) <sup>L</sup>
CHEM 461	Biochemistry II (4) <sup>L</sup>
CHEM 465	Bioinorganic Chemistry (4) <sup>L</sup>
CHEM 490	Special Topics in Chemistry (1-3)
CHEM 492	Internship/ Service Learning (1-3) <sup>L,R</sup>
CHEM 494	Independent Research (1-3) <sup>L,R</sup>
CHEM 497	Directed Studies (1-3)

<sup>R</sup> 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 units

### Recommended Electives

Choose from the following:

### Second Language

(One semester is required)

One Additional Semester of a Second Language (3units)

### Interdisciplinary General Education Courses

(CHEM 330 and EDUC 330 are required)

SPED 345	Individuals with Disabilities in Society (PSY) (3)
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### Prerequisite Courses in Education

(For CSUCI Credential Program)

EDUC 512	Equity, Diversity and Foundations of Schooling (3)
EDUC 520	Observing and Guiding Behavior in Multicultural/Multilingual and Inclusive Classrooms (3)
EDUC 521	Field Experiences (1)
EDSS 515	Adolescent Development for Secondary Educators (3)
ENGL 475	Language in Social Context (3)

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

First Year

Fall

CHEM 121	General Chemistry I (4); GE B1
MATH 150	Calculus I (4); GE B3
BIOL 200	Principles of Organismal & Population Biology (4); GE B2
	General Education (3 Units)

**Spring**

CHEM 122 General Chemistry II (4)  
BIOL 201 Principles of Cell & Molecular Biology (4)  
MATH 151 Calculus II (4)  
General Education (3 Units)

**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 Units)

**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 Units)

**Third Year****Fall**

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 Education and Electives (3 Units)

**Spring**

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 Units)  
Choose one of the following:  
BIOL 335 The Biosphere (3)  
GEOL 300 Foundations of Earth Science (4)

**Fourth Year****Fall**

Chemistry Elective or Independent Research (3-4 Units)  
General Education and Electives (12 Units)

**Spring**

CHEM 499 Chemistry Capstone (2)  
Chemistry Elective or Independent Research (3-4 Units)  
General Education and Electives (9 Units)

## Requirements for the Bachelor of Science Degree in Chemistry (120 units)

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### Lower Division Requirements (28 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. 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)

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)

A total of twenty units of electives from those listed below are needed, including a minimum of three lab courses denoted <sup>L</sup>:

CHEM	301	Environmental Chemistry - Atmosphere and Climate (3)
CHEM	302	Environmental Chemistry - Soil and Water (4) <sup>L</sup>
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) <sup>I</sup>
CHEM	335	The Chemistry of the Kitchen (3) <sup>I</sup>
CHEM	341	Drug Discovery and Development (BUS/ECON) (3) <sup>I</sup>
CHEM	343	Forensic Science (3) <sup>L, I</sup>
CHEM	344	Energy and Society (3) <sup>I</sup>
CHEM	410	Advanced Organic Synthesis (4) <sup>L</sup>
CHEM	415	Molecular Structure Determination (4) <sup>L</sup>
CHEM	420	Advanced Inorganic Chemistry (3)
CHEM	450	Instrumental Analysis and Laboratory (4) <sup>L</sup>
CHEM	461	Biochemistry II (4) <sup>L</sup>
CHEM	465	Bioinorganic Chemistry (4) <sup>L</sup>
CHEM	490	Special Topics in Chemistry (1-3)

CHEM 492	Internship/ Service Learning (1-3) <sup>L,R</sup>
CHEM 494	Independent Research (1-3) <sup>L,R</sup>
CHEM 497	Directed Studies (1-3)

<sup>L</sup> 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.

<sup>R</sup> 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 units

## 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 Units)	

#### Spring

CHEM 122	General Chemistry II (4)
MATH 151	Calculus II (4)
General Education (6-7 Units)	

### 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 Units)	

#### 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 Units)	

### 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 Units)	
General Education and Electives (6)	

#### Spring

CHEM 373	Physical Chemistry II (3)
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Chemistry Elective (3-4 Units)  
Chemistry Elective (3-4 Units)  
General Education and Electives (6 Units)

#### Fourth Year

##### Fall

CHEM 460 Biochemistry I (4)  
Chemistry Elective or Independent Research (3-4 Units)  
General Education and Electives (6-7 Units)

##### Spring

CHEM 499 Chemistry Capstone (2)  
Chemistry Elective (3-4 Units)  
Chemistry Elective or Independent Research (3-4 Units)  
General Education and Electives (6 Units)

## Requirements for the Bachelor of Science Degree in Chemistry, Biochemistry Option (120 units)

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### 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 & 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:

PHYS 101 Introduction to Physics II (4)  
PHYS 201 General Physics II (4)

### Upper Division Requirements (32 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<sup>L</sup>.

- CHEM 301 Environmental Chemistry - Atmosphere and Climate (3)
- CHEM 302 Environmental Chemistry - Soil and Water (4)<sup>L</sup>
- 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)<sup>I</sup>
- CHEM 341 Drug Discovery and Development (BUS/ECON) (3)<sup>I</sup>
- CHEM 343 Forensic Science (3)<sup>L, I</sup>
- CHEM 344 Energy and Society (3)<sup>I</sup>
- CHEM 373 Physical Chemistry II (3)
- CHEM 410 Advanced Organic Synthesis (4)<sup>L</sup>
- CHEM 415 Molecular Structure Determination (4)<sup>L</sup>
- CHEM 420 Advanced Inorganic Chemistry (3)
- CHEM 450 Instrumental Analysis and Laboratory (4)<sup>L</sup>
- CHEM 465 Bioinorganic Chemistry (4)<sup>L</sup>
- CHEM 490 Special Topics in Chemistry (1-3)
- CHEM 492 Internship/ Service Learning (1-3)<sup>L, R</sup>
- CHEM 494 Independent Research (1-3)<sup>L, R</sup>
- CHEM 497 Directed Studies (1-3)

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

<sup>R</sup> 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 Requirement.....6
- Other Courses in GE Categories A-E.....36
- Electives in Any Discipline ..... 5 units

## 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 Units)

**Spring**

BIOL 201 Principles of Cell & Molecular Biology (4)  
CHEM 122 General Chemistry II (4)  
MATH 151 Calculus II (4)  
General Education (3 Units)

**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 Units)

**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 (PHYS 101 or 201) (4)  
General Education (3 Units)

**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**

Chemistry Elective (3-4 Units)  
BIOL 400 Molecular Biology (4)  
General Education or Electives (6-7 Units)

**Fourth Year**

**Fall**

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

**Spring**

CHEM 461 Biochemistry II (4)  
CHEM 499 Chemistry Capstone (2)  
General Education or Electives (9 Units)

## Requirements for the Minor in Chemistry (23 units)

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### 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.

## Requirements for the Certificate in Chemistry (23 units)

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### 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.

**SUMMARY OF CHANGES (Check applicable box below)**

- Adding elective courses
- Updating faculty or addresses
- Minor editing for clarity
- Other, Please briefly explain

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Simone Aloisio      2/10/2009  
Proposer of Program Modification      Date

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# APPROVAL SHEET

Program:

Program Chair <u>Simone Aloisio</u>		
Date	Signature	

Curriculum Chair		
Date	Signature	

Dean of Faculty		
Date	Signature	