

# DEPARTMENT OF CHEMISTRY

The Department of Chemistry offers a Bachelor of Arts degree in Chemistry, a Bachelor of Science degree in Chemistry, and a Bachelor of Science degree in Biochemistry, as well as a minor in Chemistry.

## Admission Policy

The goal of the Department of Chemistry is to provide undergraduate students a program of study with the highest possible standards. The admission policy of the Department of Chemistry is designed to identify those students most likely to succeed in their undergraduate chemistry education.

### Direct Admission Criteria

Applicants entering UTSA will be directly admitted to the Department of Chemistry if they:

- meet all UTSA undergraduate admission requirements,
- are ranked in the top 15 percent of their high school class, have a minimum 1350 SAT\* or 29 ACT score, and
- are Calculus I ready (<https://future.utsa.edu/ready/calculus-ready/>)

\* *New SAT scores combine Evidence-Based Reading and Writing and Math.*

Transfer applicants entering UTSA will be directly admitted to the Department of Chemistry if they:

- meet all UTSA undergraduate admission requirements,
- have a transfer grade point average (GPA) of 2.50 or higher,
- have completed CHE 1103 General Chemistry I or equivalent with a grade of "C-" or better, and
- are Calculus I ready (<https://future.utsa.edu/ready/calculus-ready/>)

### Admission Criteria for Applicants Who Do Not Meet Direct Admission Criteria

Applicants for admission to the Department of Chemistry who do not meet the direct admission requirements, but meet UTSA's general admission requirements, will be part of Life and Health Sciences Studies (XLHS) or Engineering, Mathematics, and Sciences Studies (XEMS).

In order to declare Chemistry or Biochemistry as a major, a student's academic performance will be evaluated after the following requirements have been met:

- have a grade point average of at least 2.0 for all UTSA coursework,
- have successfully completed each of the two courses below with a grade of "C-" or better and earned grade point average of at least 2.25 for these courses, and
- have successfully satisfied all three sections (mathematics, reading, and writing) of the Texas Success Initiative (TSI)
- have successfully completed CHE 1103 General Chemistry I and MAT 1093 Precalculus, or equivalent courses, with a grade of "C-" or better.

Applicants who have completed all the above courses as equivalent transferable college credit with a grade of "C-" or better and have no UTSA coursework can declare a Chemistry or Biochemistry major if they:

- meet all UTSA undergraduate admission requirements,
- have a cumulative grade point average of 2.5 or better for transfer courses equivalent to the two courses listed above, and
- have successfully satisfied all three sections (mathematics, reading, and writing) of the Texas Success Initiative (TSI).

Students who are not Chemistry or Biochemistry majors are restricted from registering for upper-division (3000- and 4000-level) Chemistry courses without the consent of an undergraduate academic advisor. A student who does not meet all the above requirements after completing the above 6 credit hours must choose a major other than biochemistry or chemistry. A chemistry minor is, however, available to all UTSA students who seek to complement a different academic major with a stronger foundation in chemistry.

- B.S. degree in Chemistry (p. 1)
- B.S. degree in Biochemistry (p. 3)
- B.A. degree in Chemistry (p. 5)

## Bachelor of Science Degree in Chemistry

The Bachelor of Science (B.S.) degree in Chemistry provides opportunities for preparation for careers in industry, governmental agencies, environmental studies, preprofessional programs, and medical technology, and for graduate study in chemistry or other related fields. The degree plan, as described below for the B.S. degree in Chemistry, meets the minimum requirements for professional chemists as defined by the American Chemical Society, and recipients receive a certificate from the American Chemical Society.

The minimum number of semester credit hours required for this degree, including the Core Curriculum requirements, is 120, at least 39 of which must be at the upper-division level. All major and support work courses must be completed with a grade of "C-" or better.

All candidates seeking this degree must fulfill the Core Curriculum requirements and the degree requirements, which are listed below.

### Core Curriculum Requirements (42 semester credit hours)

Students seeking the Bachelor of Science degree in Chemistry must fulfill University Core Curriculum requirements in the same manner as other students. The courses listed below satisfy both degree requirements and Core Curriculum requirements; however, if these courses are taken to satisfy both requirements, then students may need to take additional courses in order to meet the minimum number of semester credit hours required for this degree.

MAT 1214 may be used to satisfy the core requirement in Mathematics as well as a major requirement. The following two courses may be used to satisfy the core requirement in Life and Physical Sciences as well as major requirements: PHY 1943 and PHY 1963. STA 1053 may be used to satisfy the Component Area Option core requirement as well as a major requirement.

Core Curriculum Component Area Requirements (<http://catalog.utsa.edu/undergraduate/bachelorsdegreeregulations/degreerequirements/corecurriculumcomponentarearequirements/>)

First Year Experience Requirement	3
Communication	6
Mathematics	3
Life and Physical Sciences	6

Language, Philosophy and Culture	3
Creative Arts	3
American History	6
Government-Political Science	6
Social and Behavioral Sciences	3
Component Area Option	3
<b>Total Credit Hours</b>	<b>42</b>

## Gateway Courses

Students pursuing the B.S. degree in Chemistry must successfully complete each of the following Gateway Courses with a grade of "C-" or better in no more than two attempts. A student who is unable to successfully complete these courses within two attempts, including dropping a course with a grade of "W" or taking an equivalent course at another institution, will be required to change his or her major.

CHE 1103	General Chemistry I
MAT 1214	Calculus I
MAT 1224	Calculus II

## Degree Requirements

### A. Required courses in chemistry

CHE 1103	General Chemistry I	3
CHE 1113	General Chemistry II	3
CHE 1121	General Chemistry I Laboratory	1
CHE 1131	General Chemistry II Laboratory	1
CHE 2603	Organic Chemistry I	3
CHE 2612	Organic Chemistry I Laboratory	2
CHE 2803	Quantitative Topics for Chemists	3
CHE 3214	Analytical Chemistry	4
CHE 3464	Descriptive Inorganic Chemistry	4
CHE 3643	Organic Chemistry II	3
CHE 3652	Organic Chemistry II Laboratory	2
CHE 3804	Physical Chemistry I and Laboratory	4
CHE 3824	Physical Chemistry II and Laboratory	4
CHE 4213	Instrumental Analysis	3
CHE 4303	Biochemistry I	3
CHE 4463	Inorganic Chemistry	3
CHE 4913	Independent Study	3
or CHE 4923	Special Project in Chemistry	
CHE 4971	Proseminar	1

### B. Approved upper-division chemistry electives

Select 9 additional semester credit hours of approved upper-division chemistry electives, 6 hours of which must be organized courses in chemistry at the 4000 level or above; no more than 3 semester credit hours may be from CHE 4913 Independent Study, CHE 4923 Special Project in Chemistry, or CHE 4993 Honors Research.

### C. Support work in science, mathematics, and statistics

1. Required courses:

MAT 1214	Calculus I	4
MAT 1224	Calculus II	4
PHY 1943 & PHY 1951	Physics for Scientists and Engineers I and Physics for Scientists and Engineers I Laboratory	4

PHY 1963 & PHY 1971	Physics for Scientists and Engineers II and Physics for Scientists and Engineers II Laboratory	4
STA 1053	Basic Statistics	3
2. Elective work from the College of Science approved by the advisor		3
<b>D. Electives</b>		
Select 6 semester credit hours of electives		6
<b>Total Credit Hours</b>		<b>87</b>

## Course Sequence Guide for B.S. Degree in Chemistry

This course sequence guide is designed to assist students in completing their UTSA undergraduate Chemistry degree requirements. *This is merely a guide and students must satisfy other requirements of this catalog and meet with their academic advisor for individualized degree plans.* Progress within this guide depends upon such factors as course availability, individual student academic preparation, student time management, work obligations, and individual financial considerations. Students may choose to take courses during Summer terms to reduce course loads during long semesters.

### B.S. in Chemistry – Recommended Four-Year Academic Plan

#### First Year

		Credit Hours
<b>Fall</b>		
AIS 1203	Academic Inquiry and Scholarship (core)	3
CHE 1103	General Chemistry I	3
CHE 1121	General Chemistry I Laboratory <sup>1</sup>	1
MAT 1214	Calculus I (core and major)	4
WRC 1013	Freshman Composition I (core)	3
<b>Credit Hours</b>		<b>14</b>

#### Spring

CHE 1113	General Chemistry II	3
CHE 1131	General Chemistry II Laboratory <sup>1</sup>	1
MAT 1224	Calculus II	4
STA 1053	Basic Statistics (core and major)	3
WRC 1023	Freshman Composition II (core)	3
<b>Credit Hours</b>		<b>14</b>

#### Second Year

##### Fall

CHE 2603	Organic Chemistry I	3
CHE 2612	Organic Chemistry I Laboratory <sup>1</sup>	2
CHE 3214	Analytical Chemistry	4
PHY 1943 & PHY 1951	Physics for Scientists and Engineers I and Physics for Scientists and Engineers I Laboratory (core and major)	4
<b>Credit Hours</b>		<b>13</b>

##### Spring

CHE 2803	Quantitative Topics for Chemists	3
CHE 3643	Organic Chemistry II	3
CHE 3652	Organic Chemistry II Laboratory <sup>1</sup>	2

PHY 1963 & PHY 1971	Physics for Scientists and Engineers II and Physics for Scientists and Engineers II Laboratory (core and major)	4
American History core		3
	Credit Hours	15
<b>Summer</b>		
Government-Political Science core		3
College of Sciences elective		3
	Credit Hours	6
<b>Third Year</b>		
<b>Fall</b>		
CHE 3804	Physical Chemistry I and Laboratory	4
CHE 4303	Biochemistry I	3
Free elective		3
Government-Political Science core		3
Language, Philosophy & Culture core		3
	Credit Hours	16
<b>Spring</b>		
CHE 3464	Descriptive Inorganic Chemistry	4
CHE 3824	Physical Chemistry II and Laboratory	4
American History core		3
Social & Behavioral Sciences core		3
	Credit Hours	14
<b>Fourth Year</b>		
<b>Fall</b>		
CHE 4463	Inorganic Chemistry	3
CHE 4913 or CHE 4923	Independent Study (or Special Project in Chemistry) or Special Project in Chemistry	3
Upper-division CHE elective		3
Upper-division CHE elective		3
COS elective		3
	Credit Hours	15
<b>Spring</b>		
CHE 4213	Instrumental Analysis	3
CHE 4971	Proseminar	1
Free elective		3
Upper-division CHE elective		3
Creative Arts core		3
	Credit Hours	13
	Total Credit Hours	120

<sup>1</sup> These laboratory courses include a lecture component as indicated on the University Schedule of Classes.

Note: Some courses are only offered once a year: Fall or Spring. Check with the Department of Chemistry for scheduling of courses.

## Bachelor of Science Degree in Biochemistry

The Bachelor of Science (B.S.) degree in Biochemistry provides opportunities for preparation for careers in industry, governmental agencies, environmental studies, preprofessional programs, and medical technology, and for graduate study in chemistry or other related fields. The degree plan, as described below for the B.S. degree in Biochemistry, meets the minimum requirements for professional chemists as defined by the American Chemical Society, and recipients receive a certificate from the American Chemical Society. It utilizes courses from the Chemistry, Biology, and Physics departments to structure education in all the major aspects of Biochemistry.

The minimum number of semester credit hours required for this degree, including the Core Curriculum requirements, is 120, at least 39 of which must be at the upper-division level. All major and support work courses must be completed with a grade of "C-" or better.

All candidates seeking this degree must fulfill the Core Curriculum requirements and the degree requirements, which are listed below.

### Core Curriculum Requirements (42 semester credit hours)

Students seeking the B.S. degree in Biochemistry must fulfill University Core Curriculum requirements in the same manner as other students. The courses listed below satisfy both degree requirements and Core Curriculum requirements; however, if these courses are taken to satisfy both requirements, then students may need to take additional courses in order to meet the minimum number of semester credit hours required for this degree.

MAT 1214 may be used to satisfy the core requirement in Mathematics as well as a major requirement. The following two courses may be used to satisfy the core requirement in Life and Physical Sciences as well as major requirements: PHY 1943 and PHY 1963. BIO 1404 may be used to satisfy the Component Area Option core requirement.

Core Curriculum Component Area Requirements (<http://catalog.utsa.edu/undergraduate/bachelorsdegreeregulations/degreerequirements/corecurriculumcomponentarearequirements/>)

First Year Experience Requirement	3
Communication	6
Mathematics	3
Life and Physical Sciences	6
Language, Philosophy and Culture	3
Creative Arts	3
American History	6
Government-Political Science	6
Social and Behavioral Sciences	3
Component Area Option	3
Total Credit Hours	42

### Gateway Courses

Students pursuing the B.S. degree in Biochemistry must successfully complete each of the following Gateway Courses with a grade of "C-" or better in no more than two attempts. A student who is unable to successfully complete these courses within two attempts, including dropping a course with a grade of "W" or taking an equivalent course at another institution, will be required to change his or her major.

CHE 1103	General Chemistry I
MAT 1214	Calculus I
MAT 1224	Calculus II

## Degree Requirements

### A. Required chemistry courses

CHE 1103	General Chemistry I	3
CHE 1113	General Chemistry II	3
CHE 1121	General Chemistry I Laboratory	1
CHE 1131	General Chemistry II Laboratory	1
CHE 2603	Organic Chemistry I	3
CHE 2612	Organic Chemistry I Laboratory	2
CHE 3214	Analytical Chemistry	4
CHE 3464	Descriptive Inorganic Chemistry	4
CHE 3643	Organic Chemistry II	3
CHE 3652	Organic Chemistry II Laboratory	2
CHE 3854	Basic Biophysical Chemistry Lecture/Lab	4
CHE 4303	Biochemistry I	3
CHE 4313	Biochemistry II	3
CHE 4332	Biochemistry II Laboratory	2
CHE 4913	Independent Study	3
CHE 4971	Proseminar	1

### B. Required biology and physics courses

BIO 1404	Biosciences I	4
BIO 1414	Biosciences II	4
BIO 2313	Genetics	3
BIO 2362	Molecular Genetics Laboratory	2
BIO 3813	Cell Biology	3
BIO 3362	Molecular Biochemistry Laboratory	2
BIO 3913	Molecular Biology	3
PHY 4833	Molecular Biophysics	3

### C. Upper-division biology and chemistry electives

6 additional semester credit hours of approved upper-division electives which must be organized courses in chemistry or biology at the 4000 level or above; no more than 3 semester credit hours may be from CHE 4913 Independent Study, BIO 4923 Laboratory Research, or CHE 4993 Honors Research.

### D. Support work in science and mathematics

#### 1. Required courses

MAT 1214	Calculus I	4
MAT 1224	Calculus II	4
PHY 1943 & PHY 1951	Physics for Scientists and Engineers I and Physics for Scientists and Engineers I Laboratory	4
PHY 1963 & PHY 1971	Physics for Scientists and Engineers II and Physics for Scientists and Engineers II Laboratory	4

#### 2. Electives

5 additional semester credit hours of elective work from the College of Sciences, as approved by the advisor.

Total Credit Hours 93

## Course Sequence Guide for B.S. Degree in Biochemistry

This course sequence guide is designed to assist students in completing their UTSA undergraduate Biochemistry degree requirements. *This is merely a guide and students must satisfy other requirements of this catalog and meet with their academic advisor for individualized degree plans.* Progress within this guide depends upon such factors as course availability, individual student academic preparation, student time management, work obligations, and individual financial considerations. When available, students may choose to take courses during Summer terms to reduce course loads during long semesters.

### B.S. in Biochemistry – Recommended Four-Year Academic Plan

#### First Year

Fall		Credit Hours
AIS 1203	Academic Inquiry and Scholarship (core)	3
BIO 1404	Biosciences I (core and major)	4
CHE 1103	General Chemistry I	3
CHE 1121	General Chemistry I Laboratory <sup>1</sup>	1
MAT 1214	Calculus I (core and major)	4
Credit Hours		15

#### Spring

BIO 1414	Biosciences II	4
CHE 1113	General Chemistry II	3
CHE 1131	General Chemistry II Laboratory	1
MAT 1224	Calculus II	4
WRC 1013	Freshman Composition I	3
Credit Hours		15

#### Second Year

##### Fall

BIO 2313	Genetics	3
CHE 2603	Organic Chemistry I	3
CHE 2612	Organic Chemistry I Laboratory <sup>1</sup>	2
PHY 1943 & PHY 1951	Physics for Scientists and Engineers I and Physics for Scientists and Engineers I Laboratory (core and major)	4
Government-Political Science Core		3
Credit Hours		15

##### Spring

CHE 3643	Organic Chemistry II	3
CHE 3652	Organic Chemistry II Laboratory <sup>1</sup>	2
PHY 1963 & PHY 1971	Physics for Scientists and Engineers II and Physics for Scientists and Engineers II Laboratory (core and major)	4
WRC 1023	Freshman Composition II (core)	3
BIO 2362	Molecular Genetics Laboratory	2
Credit Hours		14

#### Third Year

##### Fall

BIO 3362	Molecular Biochemistry Laboratory	2
BIO 3813	Cell Biology	3

CHE 4303	Biochemistry I	3
Upper-division BIO or CHE elective		3
American History core		3
Social & Behavioral Sciences core		3
Credit Hours		17

**Spring**

BIO 3913	Molecular Biology	3
CHE 4313	Biochemistry II	3
CHE 4332	Biochemistry II Laboratory	2
American History core		3
Creative Arts core		3
Credit Hours		14

**Fourth Year****Fall**

CHE 3214	Analytical Chemistry	4
CHE 3854	Basic Biophysical Chemistry Lecture/Lab	4
CHE 4913 or BIO 4923	Independent Study or Laboratory Research: Biology Concentrations	3
Government-Political Science core		3
Upper-division BIO or CHE elective		3
Credit Hours		17

**Spring**

CHE 3464	Descriptive Inorganic Chemistry	4
CHE 4971	Proseminar	1
PHY 4833	Molecular Biophysics	3
Language, Philosophy, & Culture core		3
Upper-division COS elective		2
Credit Hours		13
Total Credit Hours		120

<sup>1</sup> These laboratory courses include a lecture component as indicated on the University Schedule of Classes.

Note: Some courses are only offered once a year: Fall or Spring. Check with the Departments of Chemistry and Biology for scheduling of courses.

## Bachelor of Arts Degree in Chemistry

The Bachelor of Arts (B.A.) degree in Chemistry is a less comprehensive degree than the B.S. degree in Chemistry. It provides opportunities for preparation for careers in industry, governmental agencies, environmental studies, and preprofessional programs. It is not recommended for students planning to pursue graduate studies in chemistry or related fields. It does not meet the criteria for an American Chemical Society approved degree in chemistry.

The minimum number of semester credit hours required for this degree, including the Core Curriculum requirements, is 120, at least 39 of which must be at the upper-division level. All major and support work courses must be completed with a grade of "C-" or better.

All candidates seeking this degree must fulfill the Core Curriculum requirements and the degree requirements, which are listed below.

## Core Curriculum Requirements (42 semester credit hours)

Students seeking the B.A. degree in Chemistry must fulfill University Core Curriculum requirements in the same manner as other students. The courses listed below satisfy both degree requirements and Core Curriculum requirements; however, if these courses are taken to satisfy both requirements, then students may need to take additional courses in order to meet the minimum number of semester credit hours required for this degree.

MAT 1214 may be used to satisfy the core requirement in Mathematics as well as a major requirement. The following two courses may be used to satisfy the core requirement in Life and Physical Sciences as well as major requirements: PHY 1943 and PHY 1963.

Core Curriculum Component Area Requirements (<http://catalog.utsa.edu/undergraduate/bachelorsdegreeregulations/degerequirements/corecurriculumcomponentarearequirements/>)

First Year Experience Requirement	3
Communication	6
Mathematics	3
Life and Physical Sciences	6
Language, Philosophy and Culture	3
Creative Arts	3
American History	6
Government-Political Science	6
Social and Behavioral Sciences	3
Component Area Option	3
Total Credit Hours	42

## Gateway Courses

Students pursuing the B.A. degree in Chemistry must successfully complete each of the following Gateway Courses with a grade of "C-" or better in no more than two attempts. A student who is unable to successfully complete these courses within two attempts, including dropping a course with a grade of "W" or taking an equivalent course at another institution, will be required to change his or her major.

CHE 1103	General Chemistry I
MAT 1214	Calculus I
MAT 1224	Calculus II

## Degree Requirements

### A. Required courses in chemistry

CHE 1103	General Chemistry I	3
CHE 1113	General Chemistry II	3
CHE 1121	General Chemistry I Laboratory	1
CHE 1131	General Chemistry II Laboratory	1
CHE 2603	Organic Chemistry I	3
CHE 2612	Organic Chemistry I Laboratory	2
CHE 3214	Analytical Chemistry	4
CHE 3464	Descriptive Inorganic Chemistry	4
CHE 3643	Organic Chemistry II	3
CHE 3652	Organic Chemistry II Laboratory	2
CHE 3854	Basic Biophysical Chemistry Lecture/Lab	4
CHE 4213	Instrumental Analysis	3
CHE 4971	Proseminar	1



**B. Upper-division chemistry electives**

Select 12 additional semester credit hours of approved upper-division chemistry electives; no more than 6 semester credit hours may be from CHE 4913 Independent Study, CHE 4923 Special Project in Chemistry, or CHE 4993 Honors Research.

**C. Support work in science and mathematics**

## 1. Required courses:

MAT 1214	Calculus I	4
MAT 1224	Calculus II	4
PHY 1943 & PHY 1951	Physics for Scientists and Engineers I and Physics for Scientists and Engineers I Laboratory	4
PHY 1963 & PHY 1971	Physics for Scientists and Engineers II and Physics for Scientists and Engineers II Laboratory	4

2. Select 18 additional semester credit hours of approved upper-division electives from the College of Sciences; up to 6 semester credit hours may be from the College of Engineering with approval of the advisor of the degree-granting program.

**D. Electives**

Select 7 semester credit hours of electives	7
<b>Total Credit Hours</b>	<b>87</b>

**Course Sequence Guide for B.A. Degree in Chemistry**

This course sequence guide is designed to assist students in completing their UTSA undergraduate Chemistry degree requirements. *This is merely a guide and students must satisfy other requirements of this catalog and meet with their academic advisor for individualized degree plans.* Progress within this guide depends upon such factors as course availability, individual student academic preparation, student time management, work obligations, and individual financial considerations. Students may choose to take courses during Summer terms to reduce course loads during long semesters.

**B.A. in Chemistry – Recommended Four-Year Academic Plan****First Year**

		<b>Credit Hours</b>
<b>Fall</b>		
AIS 1203	Academic Inquiry and Scholarship (core)	3
CHE 1103	General Chemistry I	3
CHE 1121	General Chemistry I Laboratory <sup>1</sup>	1
MAT 1214	Calculus I (core and major)	4
WRC 1013	Freshman Composition I (core)	3
	<b>Credit Hours</b>	<b>14</b>
<b>Spring</b>		
CHE 1113	General Chemistry II	3
CHE 1131	General Chemistry II Laboratory <sup>1</sup>	1
MAT 1224	Calculus II	4
WRC 1023	Freshman Composition II (core)	3
	Social & Behavioral Sciences core	3
	<b>Credit Hours</b>	<b>14</b>

**Second Year**

<b>Fall</b>		
CHE 2603	Organic Chemistry I	3
CHE 2612	Organic Chemistry I Laboratory <sup>1</sup>	2
CHE 3214	Analytical Chemistry	4

Free elective	3
American History core	3
	<b>Credit Hours</b>
	<b>15</b>

**Spring**

CHE 3643	Organic Chemistry II	3
CHE 3652	Organic Chemistry II Laboratory	2
PHY 1943 & PHY 1951	Physics for Scientists and Engineers I and Physics for Scientists and Engineers I Laboratory (core)	4

Government-Political Science core	3
Language, Philosophy and Culture core	3
	<b>Credit Hours</b>
	<b>15</b>

**Summer**

PHY 1963 & PHY 1971	Physics for Scientists and Engineers II and Physics for Scientists and Engineers II Laboratory (core)	4
	<b>Credit Hours</b>	
	<b>4</b>	

**Third Year****Fall**

Government-Political Science core	3
Upper-division CHE elective	3
Upper-division COS elective	3
Upper-division COS elective	3
Upper-division COS elective	3
	<b>Credit Hours</b>
	<b>15</b>

**Spring**

CHE 3464	Descriptive Inorganic Chemistry	4
CHE 3854	Basic Biophysical Chemistry Lecture/Lab	4
	Component Area Option core	3
	Free elective	4
	<b>Credit Hours</b>	
	<b>15</b>	

**Fourth Year****Fall**

Upper-division CHE elective	3
Upper-division CHE elective	3
Upper-division COS elective	3
Upper-division COS elective	3
American History core	3
	<b>Credit Hours</b>
	<b>15</b>

**Spring**

CHE 4213	Instrumental Analysis	3
CHE 4971	Proseminar	1
Upper-division CHE elective	3	
Upper-division COS elective	3	
Creative Arts core	3	
	<b>Credit Hours</b>	
	<b>13</b>	
	<b>Total Credit Hours</b>	
	<b>120</b>	

<sup>1</sup> These laboratory courses include a lecture component as indicated on the University Schedule of Classes.

Note: Some courses are only offered once a year: Fall or Spring. Check with the Department of Chemistry for scheduling of courses

## Minor in Chemistry

The purpose of this minor is to permit students majoring in other areas to obtain a solid, broad-based knowledge of chemistry. The minor is applicable to those students in other areas of science and in preprofessional programs. All coursework for the Minor in Chemistry must be completed with a grade of "C-" or better. All students pursuing the Minor in Chemistry must complete 23 semester credit hours.

### A. Required courses

CHE 1103	General Chemistry I	3
CHE 1113	General Chemistry II	3
CHE 1121	General Chemistry I Laboratory	1
CHE 1131	General Chemistry II Laboratory	1
CHE 2603	Organic Chemistry I	3
CHE 2612	Organic Chemistry I Laboratory	2
CHE 3643	Organic Chemistry II	3

### B. Additional chemistry courses

Select 7 additional hours of 2000-, 3000- or 4000-level chemistry courses including at least one of the following laboratory-based courses:

CHE 3214	Analytical Chemistry	
CHE 3464	Descriptive Inorganic Chemistry	
CHE 3854	Basic Biophysical Chemistry Lecture/Lab	

Total Credit Hours 23

To declare a Minor in Chemistry, obtain advice, or seek approval of substitutions for course requirements, students should consult their academic advisor.

## Chemistry (CHE) Courses

### CHE 1004. Chemistry for Allied Health Sciences. (3-3) 4 Credit Hours. (TCCN = CHEM 1405)

Introduction to atomic structure, chemical bonding, stoichiometry, states of matter, inorganic chemical reactions, and acids and bases. The course has a laboratory component to introduce general chemical laboratory techniques, principles, and methods to reinforce lecture topics. For majors in occupational therapy, prenursing, and dental hygiene. May not be applied to a major or minor in chemistry, biology, or clinical laboratory sciences. (Formerly CHE 1003 and CHE 1011. Credit cannot be earned for both CHE 1003 and CHE 1004.) Course Fees: IUC1 \$15; L001 \$30; LRS1 \$60; STSI \$28.

### CHE 1014. Elementary Organic and Biochemistry. (3-3) 4 Credit Hours. (TCCN = CHEM 1407)

Prerequisite: A grade of "C-" or better in CHE 1004 (or CHE 1003 in previous catalogs). A survey of the structures and reactions of some important functional groups of organic chemistry, and the relationship of these functional groups to the chemistry of lipids, carbohydrates, nucleic acids, and proteins. May not be applied to a major or minor in chemistry. Laboratory examination of the properties of some simple organic and biological chemicals; topics include solubility, crystallization, organic reactions, titration, enzyme action, sugars, and vitamins which will directly reinforce lecture topics. (Formerly CHE 1013 and CHE 1203. Credit can be earned for only ONE of the following: CHE 1013 or CHE 1014 or CHE 1203.) Course Fees: IUC1 \$15; L001 \$30; LRS1 \$60; STSI \$28.

### CHE 1073. Basic Chemistry. (3-0) 3 Credit Hours.

A preparatory class for CHE 1103. This course focuses on traditionally difficult concepts encountered in CHE 1103. Topics include but are not limited to: dimensional analysis, significant figures, inorganic nomenclature, and qualitative and quantitative analyses of basic chemical reactions. May not be applied to a B.S. or B.A. in Chemistry. Generally offered: Fall, Spring, Summer. Course Fees: LRS1 \$45; STSI \$21.

### CHE 1083. Introduction to the Molecular Structure of Matter. (3-0) 3 Credit Hours.

This course is an introduction to the structure of matter, with focus on the molecules of carbon that comprise living systems. Topics include covalent and ionic bonding, molecular structure, shape, and stability, isomers, organic functional groups and charge distribution in molecules, and bonding in solids. May be applied toward the Core Curriculum requirement in Life and Physical Sciences. (Same as CHE 1004. Credit cannot be earned for both CHE 1004 and CHE 1083.) Course Fees: LRC1 \$12; LRS1 \$45; STSI \$21.

### CHE 1093. Introduction to Molecular Transformations. (3-0) 3 Credit Hours.

Prerequisite: A grade of "C-" or better in CHE 1083 and in MAT 1073 or higher. This course is an introduction to the chemical reactions of matter, with focus on basic organic reactions that take place in living systems. Topics include classification of reactions, stoichiometry, reaction energetics, chemical equilibrium, acid-base chemistry, complex equilibria and reaction kinetics. May be applied toward the Core Curriculum requirement in Life and Physical Sciences. (Same as CHE 1014. Credit cannot be earned for both CHE 1014 and CHE 1093.) Course Fees: DL01 \$75; LRC1 \$12; LRS1 \$45; STSI \$21.

### CHE 1103. General Chemistry I. (3-0) 3 Credit Hours. (TCCN = CHEM 1311)

Prerequisite: AP Chemistry Score of 3 or greater, or a grade of "C-" or better in CHE 1073, or above 70% mastery in the ALEKS Chemistry assessment. Concurrent enrollment in CHE 1121 is recommended. An introduction to descriptive inorganic chemistry and atomic-molecular structure, including such fundamental concepts as the periodic system of elements, valency, chemical bonding, reactions and reaction mechanisms, stoichiometry, equilibria, acids and bases, thermochemistry, molecular-kinetic theory, and states of matter. Credit cannot be earned for both CHE 1103 and CHE 1143. Generally offered: Fall, Spring, Summer. Course Fees: LRS1 \$45; STSI \$21.

### CHE 1113. General Chemistry II. (3-0) 3 Credit Hours. (TCCN = CHEM 1312)

Prerequisite: A grade of "C-" or better in CHE 1103 or the equivalent. A continuation of CHE 1103. Elementary inorganic and physical chemistry; topics include solutions, electrolytes, oxidation-reduction reactions, reaction trends, coordination chemistry, basic thermodynamics, chemical kinetics, electrochemistry, and nuclear chemistry. Primarily for science majors. Credit cannot be earned for more than one of the following: CHE 1113, CHE 1153, or CHE 1303. Generally offered: Fall, Spring, Summer. Course Fees: LRS1 \$45; STSI \$21.

**CHE 1121. General Chemistry I Laboratory. (1-4) 1 Credit Hour. (TCCN = CHEM 1111)**

Prerequisite: A grade of "C-" or better or concurrent enrollment in CHE 1103 (or CHE 1143 in previous catalogs). An introduction to chemical problem solving and the basic operations of the chemical laboratory, and a survey of inorganic chemical reactions. This course consists of problem sessions, lecture-demonstrations, and/or laboratory experience. Laboratory to accompany CHE 1103 and CHE 1143. This laboratory includes a lecture component. (Formerly CHE 1122. Credit cannot be earned for both CHE 1121 and CHE 1122.) Generally offered: Fall, Spring, Summer. Course Fees: IUC1 \$15; L001 \$30; LRS1 \$15; STSI \$7.

**CHE 1131. General Chemistry II Laboratory. (1-4) 1 Credit Hour. (TCCN = CHEM 1112)**

Prerequisites: A grade of "C-" or better in CHE 1103 and CHE 1121, and a grade of "C-" or better or concurrent enrollment in CHE 1113 (or CHE 1153 in previous catalogs). Techniques of qualitative and quantitative chemical analysis, illustrated primarily via inorganic chemical systems and their reactions. Laboratory to accompany CHE 1113. This laboratory includes a lecture component. (Formerly CHE 1312 and CHE 1132. Credit cannot be earned for more than one of the following: CHE 1131, CHE 1132 or CHE 1312.) Generally offered: Fall, Spring, Summer. Course Fees: IUC1 \$15; L001 \$30; LRS1 \$15; STSI \$7.

**CHE 2603. Organic Chemistry I. (3-0) 3 Credit Hours. (TCCN = CHEM 2323)**

Prerequisite: A grade of "C-" or better in CHE 1113 (or CHE 1153 in previous catalogs). A study of the fundamentals of organic structure, reaction mechanisms, synthesis and spectroscopy. Primarily for majors other than chemistry and biochemistry. Discussion and problems amplify and clarify the course topics. (Same as CHE 2703. Formerly CHE 2203, CHE 2204, and CHE 2604. Credit cannot be earned for more than one of the following: CHE 2203, CHE 2204, CHE 2603, CHE 2604, or CHE 2703). Generally offered: Fall, Spring, Summer. Course Fees: LRS1 \$45; STSI \$21.

**CHE 2612. Organic Chemistry I Laboratory. (1-4) 2 Credit Hours.**

Prerequisites: A grade of "C-" or better or concurrent enrollment in CHE 1131 and CHE 2603. The first of two semesters of organic chemistry laboratory. Qualitative analysis and determination of the physical constants of organic compounds. Separation, identification, and elementary synthesis of organic compounds. Laboratory techniques—crystallization, distillation, chromatographic and spectroscopic techniques (IR, NMR, MS)—are emphasized. This laboratory includes a lecture component. (Formerly CHE 2242. Credit cannot be earned for both CHE 2612 and CHE 2242.) Generally offered: Fall, Spring, Summer. Course Fees: IUC1 \$15; L001 \$30; LRS1 \$30; STSI \$14.

**CHE 2703. Organic Chemistry I for Majors. (3-0) 3 Credit Hours.**

Prerequisite: A grade of "C-" or better in CHE 1113 (or CHE 1153 in previous catalog). An in-depth study of the organic structure, reaction mechanisms, synthesis and spectroscopy. Primarily for chemistry and biochemistry majors. Discussion and practice of problems amplifying and clarifying the course. (Same as CHE 2603. Formerly CHE 2203, CHE 2204, and CHE 2604. Credit cannot be earned for more than one of the following: CHE 2203, CHE 2204, CHE 2603, CHE 2604, or CHE 2703.) Course Fees: LRS1 \$45; STSI \$21.

**CHE 2803. Quantitative Topics for Chemists. (3-0) 3 Credit Hours.**

Prerequisite: A grade of "C-" or better in MAT 1224. This course is intended for students majoring in chemistry and serves as a prerequisite for the introductory courses in physical chemistry. Topics include: power series, linear algebra, determinants, matrices, vector spaces, multi-variable calculus (partial differentiation, multiple integrals), complex variables, ordinary differential equations, numerical analysis, and numerical methods in integration, probability, statistics, regression methods and symbolic programming. (Formerly CHE 2802. Credit cannot be earned for both CHE 2802 and CHE 2803.) Generally offered: Spring. Course Fees: LRS1 \$45; STSI \$21.

**CHE 3214. Analytical Chemistry. (2-5) 4 Credit Hours.**

Prerequisites: A grade of "C-" or better in CHE 1113 (or CHE 1153 in previous catalogs) and CHE 1131. Topics in quantitative analysis including wet chemical and basic instrumental analysis; gravimetric, volumetric, electrochemical and spectrophotometric determinations combined with error analysis; fundamentals of chemical separations; applications of stoichiometry and chemical equilibria to design efficient analytical protocols. (Formerly CHE 3103 and CHE 3213. Credit cannot be earned for more than one of the following: CHE 3103, CHE 3213, or CHE 3214.) Generally offered: Fall, Spring. Differential Tuition: \$200. Course Fees: IUC1 \$15; L001 \$30.

**CHE 3464. Descriptive Inorganic Chemistry. (3-3) 4 Credit Hours.**

Prerequisites: A grade of "C-" or better in CHE 1113 (or CHE 1153 in previous catalogs) and CHE 1131; concurrent enrollment in CHE 2603 recommended. The basic principles of inorganic chemistry applied to the properties, reactions, and periodicity of inorganic elements and compounds. Includes the synthesis and characterization of inorganic compounds and the use of specialized laboratory techniques. (Formerly CHE 3264. Credit cannot be earned for both CHE 3464 and CHE 3264.) Generally offered: Fall, Spring. Differential Tuition: \$200. Course Fees: IUC1 \$15; L001 \$30.

**CHE 3643. Organic Chemistry II. (3-0) 3 Credit Hours.**

Prerequisite: A grade of "C-" or better in CHE 2603 (or CHE 2703). Continuing study of fundamentals of organic structure, reaction mechanisms, synthesis and spectroscopy. A continuation of CHE 2603. Primarily for majors other than chemistry and biochemistry. (Same as CHE 3703. Formerly CHE 2303 and CHE 2623. Credit cannot be earned for more than one of the following: CHE 2303, CHE 2623, CHE 3703, or CHE 3643.) Generally offered: Fall, Spring, Summer. Differential Tuition: \$150.

**CHE 3652. Organic Chemistry II Laboratory. (1-4) 2 Credit Hours.**

Prerequisites: Grades of "C-" or better in CHE 2603 (or CHE 2703) and CHE 2612. Quantitative and continuing qualitative study of organic reactions and molecular structure through functional group interactions and spectroscopic techniques. Simple and multistep syntheses of organic compounds. A continuation of CHE 2612. This laboratory includes a lecture component. (Formerly CHE 2342 and CHE 2632. Credit cannot be earned for more than one of the following: CHE 2342, CHE 2632 or CHE 3652.) Generally offered: Fall, Spring, Summer. Differential Tuition: \$100. Course Fees: IUC1 \$15; L001 \$30.

**CHE 3703. Organic Chemistry II for Majors. (3-0) 3 Credit Hours.**

Prerequisite: A grade of "C-" or better in CHE 2703 (or CHE 2603). Continuing study of fundamentals of organic structure, reaction mechanisms, synthesis and spectroscopy. A continuation of CHE 2703. Primarily for chemistry and biochemistry majors. (Same as CHE 3643. Formerly CHE 2303 and CHE 2623. Credit cannot be earned for more than one of the following: CHE 2303, CHE 2623, CHE 3703, or CHE 3643.) Differential Tuition: \$150.



**CHE 3804. Physical Chemistry I and Laboratory. (3-3) 4 Credit Hours.**

Prerequisites: A grade of "C-" or better in CHE 1113 (or CHE 1153 in previous catalogs), CHE 1131, CHE 2803, PHY 1963 and PHY 1971. The laws of thermodynamics; free energy and chemical potential; ideal and nonideal gases; equilibria; solutions; kinetic theory of gases; kinetics. Laboratory study of selected physicochemical principles and methods to reinforce lecture topics. Data acquisition, data analysis, and report writing are stressed. (Formerly CHE 3204 and CHE 3803/3811. Credit cannot be earned for more than one of the following: CHE 3204, CHE 3803/3811, or CHE 3804.) (Formerly titled "Thermodynamics and Kinetics.") Generally offered: Fall. Differential Tuition: \$200. Course Fees: IUC1 \$15; L001 \$30.

**CHE 3824. Physical Chemistry II and Laboratory. (3-3) 4 Credit Hours.**

Prerequisites: A grade of "C-" or better in CHE 1113 (or CHE 1153 in previous catalogs), CHE 2803, PHY 1963 and PHY 1971. Introduction to atomic and molecular quantum chemistry; group theory; electronic, rotational, vibrational, and electronic spectroscopies; and statistical mechanics including ensembles and their use in deriving thermodynamic properties using quantum level information. Laboratory study of selected physicochemical principles and methods to reinforce lecture topics. Data acquisition, data analysis, and report writing are stressed. (Formerly CHE 3224 and CHE 3823/3831. Credit cannot be earned for more than one of the following: CHE 3224, CHE 3823/3831, or CHE 3824.) (Formerly titled "Quantum Mechanics, Spectroscopy, and Statistical Mechanics.") Generally offered: Spring. Differential Tuition: \$200. Course Fees: IUC1 \$15; L001 \$30.

**CHE 3854. Basic Biophysical Chemistry Lecture/Lab. (3-3) 4 Credit Hours.**

Prerequisites: A grade of "C-" or better in CHE 2603, MAT 1214, PHY 1963 (or PHY 1623), and PHY 1971 (or PHY 1631). The primary goal of basic biophysical chemistry is to help students develop a fundamental understanding of the physical principles that drive biological processes, particularly as applied to proteins. Topics covered include protein structure, molecular thermodynamics, structure simulation, basic statistical mechanics, quantum mechanics and spectroscopy. This course cannot be used as an upper-division chemistry elective by students pursuing a B.S. in Chemistry. Generally offered: Spring. Differential Tuition: \$200. Course Fees: IUC1 \$15; L001 \$30.

**CHE 4213. Instrumental Analysis. (2-5) 3 Credit Hours.**

Prerequisites: A grade of "C-" or better in CHE 3214 and CHE 3652. Grade of "C-" or better or concurrent enrollment in CHE 3824 (or CHE 3854). The physical and chemical principles of modern instrumental techniques used for chemical analysis. Topics include emission, absorption, magnetic resonance, and FTIR spectroscopies, mass spectrometry, and chromatography. The use of spectrometric and chromatographic instrumentation in the separation, identification, and quantitation of compounds in chemical systems. (Formerly CHE 4103. Credit cannot be earned for both CHE 4213 and CHE 4103.) Generally offered: Fall, Spring. Differential Tuition: \$150. Course Fees: IUC1 \$15; L001 \$30.

**CHE 4303. Biochemistry I. (3-0) 3 Credit Hours.**

Prerequisite: A grade of "C-" or better in CHE 3643. Structure and function relationships of biologically important molecules; energy production, storage and utilization; amino acids, nucleic acids, peptides and proteins; intermediary metabolism. (Formerly CHE 4503. Credit cannot be earned from both CHE 4303 and CHE 4503. Credit cannot be earned for both CHE 4303 and BIO 3513. BIO 3513 cannot be taken as a chemistry elective.) Generally offered: Fall, Spring. Differential Tuition: \$150.

**CHE 4313. Biochemistry II. (3-0) 3 Credit Hours.**

Prerequisites: A grade of "C" or better in CHE 4303. Structure and function relationships of biologically important molecules continued; description of advanced biophysical techniques; amino acid metabolism and metabolism integration; lipids, fatty acids, steroid, membrane metabolism; cell signaling. Differential Tuition: \$150.

**CHE 4332. Biochemistry II Laboratory. (0-4) 2 Credit Hours.**

Prerequisites: CHE 4303 and BIO 3362, and completion or concurrent enrollment in CHE 4313. A laboratory course emphasizing biochemical lab techniques used in protein purification and purity analysis, plasmid DNA prep, determination and restriction digest. Differential Tuition: \$150. Course Fees: IUC1 \$15; L001 \$30.

**CHE 4463. Inorganic Chemistry. (3-0) 3 Credit Hours.**

Prerequisites: A grade of "C-" or better in CHE 3464, and completion of or concurrent enrollment in CHE 3804 or CHE 3854. A study of the structure, bonding, and properties of inorganic compounds; acid-base theory, crystalline state, coordination chemistry, and other advanced topics. (Formerly CHE 4263. Credit cannot be earned for both CHE 4463 and CHE 4263.) Generally offered: Fall. Differential Tuition: \$150.

**CHE 4613. Introduction to Polymer Chemistry. (3-0) 3 Credit Hours.**

Prerequisites: A grade of "C-" or better in CHE 3703 and CHE 3643. Fundamental concepts of polymer chemistry, including mechanisms for synthesis, kinetics, and copolymerization; molecular weight, stereoisomerism, morphology, solubility, and thermal transitions; visco- and rubber elasticity; and the molecular basis for physical properties. (Formerly CHE 4203. Credit cannot be earned for both CHE 4613 and CHE 4203.) Differential Tuition: \$150.

**CHE 4853. Computational Chemistry. (3-0) 3 Credit Hours.**

Prerequisite: A grade of "C-" or better in CHE 3824 or consent of instructor. The application of molecular mechanical, molecular orbital, and density functional methods to problems of molecular structure, property, reactivity, and spectroscopy. Generally offered: Summer. Differential Tuition: \$150.

**CHE 4883. Introduction to Mass Spectrometry. (2-3) 3 Credit Hours.**

Prerequisite: A grade of "C-" or better in CHE 3804 (or CHE 3854), or consent of instructor. The basic principles of interpreting mass spectra and how they are produced. The effect the method of ion production has on the observed mass spectra, and the theory and operation of various types of mass spectrometers will be covered. The basic theory of ion-molecule reactions and principles and practice of biological mass spectrometry and other advanced topics will be presented. (Formerly CHE 4383. Credit cannot be earned for both CHE 4883 and CHE 4383.) Differential Tuition: \$150. Course Fees: IUC1 \$15; L001 \$30.

**CHE 4911. Independent Study. (0-0) 1 Credit Hour.**

Prerequisites: Permission in writing (form available) from the instructor, the student's advisor, the Department Chair, and Dean of the College in which this course is offered. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor's degree. Differential Tuition: \$50.

**CHE 4912. Independent Study. (0-0) 2 Credit Hours.**

Prerequisites: Permission in writing (form available) from the instructor, the student's advisor, the Department Chair, and Dean of the College in which this course is offered. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor's degree. Differential Tuition: \$100.

**CHE 4913. Independent Study. (0-0) 3 Credit Hours.**

Prerequisites: Permission in writing (form available) from the instructor, the student's advisor, the Department Chair, and Dean of the College in which this course is offered. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor's degree. Differential Tuition: \$150.

**CHE 4923. Special Project in Chemistry. (0-0) 3 Credit Hours.**

Prerequisite: Consent of Department Chair (form available in department office). A special laboratory research or library readings project under the direction of a faculty member that results in a report. Limited to science majors in their final year of undergraduate study. Differential Tuition: \$150.

**CHE 4953. Special Studies in Chemistry. (3-0) 3 Credit Hours.**

Prerequisites: Upper-division standing and consent of instructor. An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Studies may be repeated for credit when the topics vary, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor's degree. Generally offered: Fall, Spring, Summer. Differential Tuition: \$150.

**CHE 4971. Proseminar. (0-3) 1 Credit Hour.**

Prerequisite: A grade of "C-" or better in CHE 3643. Oral reports on current publications in chemistry and chemical technology using important chemical reference materials and periodicals. May be repeated for credit, but not more than 2 semester credit hours may be applied toward the degree. Generally offered: Fall, Spring. Differential Tuition: \$50.

**CHE 4993. Honors Research. (0-0) 3 Credit Hours.**

Prerequisites: Enrollment limited to candidates for College Honors during their last two semesters; approval by the College Honors Committee. Supervised research and preparation of an honors thesis. May be repeated only once with approval. Generally offered: Fall, Spring. Differential Tuition: \$150.