BIOCHEMISTRY

Chemistry is often called the *central science* because of the pivotal role it plays in the biological and physical sciences, as well as in engineering, agriculture, medicine, and allied health disciplines. Bachelor's degree chemists choose from diverse paths for their short-term and lifetime careers, including graduate study in a variety of programs, rewarding employment in industry or government laboratories, professional or law school, or much-needed teaching in high schools.

About this Program

- **College:** Liberal Arts and Sciences (http://catalog.ufl.edu/UGRD/colleges-schools/UGLAS/)
- **Degree:** Bachelor of Science
- **Specializations:** Biochemistry (p. 1) | Chemistry (http://catalog.ufl.edu/UGRD/colleges-schools/UGLAS/CHY_BS/CHY_BS_BS/)
- **Credits for Degree:** 120
- **More Info**

To graduate with this major, students must complete all university, college, and major requirements.

Department Information

The Department of Chemistry is a comprehensive department granting bachelor's, master's, and PhD degrees with specialization in all areas including biochemistry, nanochemistry, analytical, inorganic, organic, physical, polymer, synthetic, and theoretical chemistry. The University of Florida ranks in the top five chemistry departments nationally in PhD production and is among the top 20 in bachelor's graduates.
Website (https://www.chem.ufl.edu/)

CONTACT

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P.O. Box 117200
214 LEIGH HALL
GAINESVILLE FL 32611-7200
Map (http://campusmap.ufl.edu/#/index/0009)

Curriculum

- Chemistry Minor
- Chemistry | Biochemistry

Students can choose the Chemistry specialization, which is comparable to that offered in any major university, or the Biochemistry specialization, which is designed to give more flexibility to students wanting to pursue courses with biological focus. The department encourages students in either specialization to include undergraduate research with one of the department's internationally recognized faculty as a component of the undergraduate experience. Undergraduate research will frequently result in journal publications and presentations at scientific meetings.

Requirements for the Major

The Biochemistry major requires a total of 62-69 credits including 29-34 credits of foundation coursework and 33-35 credits of major coursework. All required courses must be completed within two attempts with minimum grades of C.

Code	Title	Credits
Required Foundation Coursework		
BSC 2010	Integrated Principles of Biology 1	4
& 2010L	and Integrated Principles of Biology Laboratory	
BSC 2011	Integrated Principles of Biology 2	4
& 2011L	and Integrated Principles of Biology Laboratory 2	
Select one option:		5-8
Option A [1]		
CHM 2045	General Chemistry 1	
& 2045L	and General Chemistry Laboratory	
CHM 2046	General Chemistry 2	
& 2046L	and General Chemistry 2 Laboratory	
Option B		
CHM 2045	General Chemistry 1	
& 2045L	and General Chemistry Laboratory	
CHM 2051	Honors General Chemistry 2	
& CHM 2046L	and General Chemistry 2 Laboratory	

Option C		
CHM 2047 & 2047L	One-Semester General Chemistry and One-Semester General Chemistry Laboratory [1]	
MAC 2311 & MAC 2312	Analytic Geometry and Calculus 1 and Analytic Geometry and Calculus 2	8
Select one option:		8-10
Option A		
PHY 2053 & 2053L	Physics 1 and Laboratory for PHY 2053	
PHY 2054 & 2054L	Physics 2 and Laboratory for PHY 2054	
Option B		
PHY 2048 & 2048L	Physics with Calculus 1 and Laboratory for PHY 2048	
PHY 2049 & 2049L	Physics with Calculus 2 and Laboratory for PHY 2049	
Required Core Coursework		
Select one:		4-6
CHM 2212 & CHM 2213	Organic Chemistry 1 for Majors and Organic Chemistry 2 for Majors	
CHM 2210 & CHM 2211	Organic Chemistry 1 and Organic Chemistry 2	
CHM 3217	Organic Chemistry/Biochemistry 1	
CHM 2211L	Organic Chemistry Laboratory	2
CHM 3120 & 3120L	Introduction to Analytical Chemistry and Analytical Chemistry Laboratory	4
CHM 3218	Organic Chemistry/Biochemistry 2	4
CHM 3610	Inorganic Chemistry	3
CHM 3400 & CHM 4413L	Physical Chemistry for the Biosciences and Biophysical Chemistry Laboratory	5
CHM 4300L	Laboratory in Biochemistry and Molecular Biology	2
MCB 3020	Basic Biology of Microorganisms	3
Required Biochemistry Electives		**6**
Total Credits		**62-69**

[1] CHM 2054L can substitute for the CHM 2045L/CHM 2046L sequence or for CHM 2047L.

ISC 2400L *can substitute for the* CHM 2045L, BSC 2010L *and* PHY 2053L *requirements.* ISC 2401L *can substitute for the* CHM 2046L, BSC 2011L *and* PHY 2054L *requirements.*

UFTeach Program

There is a severe shortage of qualified high school chemistry teachers in Florida and nationwide. Students interested in becoming part of this high-demand profession should see a chemistry advisor about the UFTeach program. UFTeach students complete the UFTeach minor in science teaching with their BS in Chemistry and have the coursework and preparation for professional teacher certification in Florida when they graduate.
More Info (https://education.ufl.edu/uf-teach/)

Required Exit Exam

Students must also complete the exit exam (Diagnostic of Undergraduate Chemistry Knowledge) with a minimum score of 30 out of 60.

Critical Tracking

Critical Tracking records each student's progress in courses that are required for progress toward each major. Please note the critical-tracking requirements below on a per-semester basis.

For degree requirements outside of the major, refer to CLAS Degree Requirements: Structure of a CLAS Degree.

Equivalent critical-tracking courses as determined by the State of Florida Common Course Prerequisites (https://cpm.flvc.org/advance-search/) may be used for transfer students.

Semester 1

- Complete one CHM course and one MAC course
- 2.0 UF GPA required

Semester 2

- Complete CHM 2045/CHM 2045L and MAC 2311
- 2.50 critical-tracking GPA and any additional CHM courses
- 2.0 UF GPA required

Semester 3

- Complete CHM 2046/CHM 2046L and BSC 2010/BSC 2010L
- 2.65 critical-tracking GPA any additional CHM courses
- 2.0 UF GPA required

Semester 4

- Complete BSC 2011/BSC 2011L
- 2.75 critical-tracking GPA and any additional CHM courses
- 2.0 UF GPA required

Semester 5

- Complete MAC 2312 and CHM 2212, CHM 2210, or CHM 3217
- 2.75 critical-tracking GPA and any additional CHM courses
- 2.0 UF GPA required

Semester 6

- Complete CHM 3120/CHM 3120L, and CHM 2213/CHM 2211L or CHM 2211/CHM 2211L
- 2.0 UF GPA required

Semester 7

- Complete CHM 3218 and at least 1 of the remaining CHM 3XXX/4XXX or Biochemistry elective required courses
- 2.0 UF GPA required

Semester 8

- Complete all of the remaining CHM 3XXX/4XXX and Biochemistry elective required courses
- 2.0 UF GPA required

Model Semester Plan

Students are expected to complete the Writing, Civic Literacy, summer enrollment, and Quest requirements while in the process of taking the courses below. Students are also expected to complete the general education international (GE-N) requirements concurrently with another general education requirement (typically, GE-C, H, or S) as part of the CLAS Basic Distribution requirements. One of the two general education mathematics courses must be a pure math course.

College of Liberal Arts and Sciences allows students additional flexibility in its Distribution Requirements. Students may count a maximum of 6 credits TOTAL from the CLAS Distribution course lists towards Humanities, Social and Behavioral Sciences, or Biological and Physical Sciences, with no more than 3 credits of Humanities, 3 credits of Social and Behavioral Sciences, or 6 credits of Biological or Physical Sciences.

The full list of major-specific requirements for this major can be found on the Overview tab. College of Liberal Arts and Sciences degree requirements can be found on the College's degree requirements page. (https://catalog.ufl.edu/UGRD/colleges-schools/UGLAS/#degreerequirementstext)

MAC 2312, MCB 3020, PHY 2049, PHY 2049L, PHY 2054, PHY 2054L, and Biochemistry electives outside of the Chemistry department count towards 3000-level or above electives outside of the major.

To remain on track, students must complete the appropriate critical-tracking courses, which appear in bold. These courses must be completed by the terms as listed above in the Critical Tracking criteria.

This semester plan represents an example progression through the major. Actual courses and course order may be different depending on the student's academic record and scheduling availability of courses. Prerequisites still apply.

Course	Title	Credits
Semester One		
Quest 1		3
CHM 2045 & 2045L	General Chemistry 1 and General Chemistry Laboratory (**Critical Tracking**; State Core Gen Ed Physical Sciences; Natural Science Laboratory) [2]	4
MAC 2311	Analytic Geometry and Calculus 1 (**Critical Tracking**; State Core Gen Ed Mathematics)	4
State Core Gen Ed Composition (http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext); Writing Requirement		3
	Credits	**14**
Semester Two		
BSC 2010 & 2010L	Integrated Principles of Biology 1 and Integrated Principles of Biology Laboratory (**Critical Tracking**; Gen Ed Biological Sciences)	4
CHM 2046 & 2046L	General Chemistry 2 and General Chemistry 2 Laboratory (**Critical Tracking**; Gen Ed Physical Sciences)	4
MAC 2312	Analytic Geometry and Calculus 2 (**Critical Tracking**; Gen Ed Mathematics)	4
State Core Gen Ed Social and Behavioral Sciences (http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext)		3
	Credits	**15**
Semester Three		
BSC 2011 & 2011L	Integrated Principles of Biology 2 and Integrated Principles of Biology Laboratory 2 (**Critical Tracking**; Gen Ed Biological Sciences)	4
CHM 2212	Organic Chemistry 1 for Majors (**Critical Tracking**)	3
State Core Gen Ed Humanities (http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext)		3
CLAS Foreign Language Proficiency Requirement [1]		4-5
	Credits	**14-15**
Semester Four		
Quest 2		3
CHM 2211L	Organic Chemistry Laboratory (**Critical Tracking**)	2
CHM 2213	Organic Chemistry 2 for Majors (**Critical Tracking**)	3
PHY 2053 & 2053L	Physics 1 and Laboratory for PHY 2053 (Gen Ed Physical Sciences)	5
CLAS Foreign Language Proficiency Requirement [1]		3-5
	Credits	**16-18**
Semester Five		
CHM 3120 & 3120L	Introduction to Analytical Chemistry and Analytical Chemistry Laboratory (**Critical Tracking**)	4
CHM 3218	Organic Chemistry/Biochemistry 2 (**Critical Tracking**)	4
PHY 2054 & 2054L	Physics 2 and Laboratory for PHY 2054 (Gen Ed Physical Sciences)	5
Elective (or CLAS Foreign Language Proficiency Requirement if 4-3-3 language option) [1]		3
	Credits	**16**
Semester Six		
CHM 3400	Physical Chemistry for the Biosciences	3
CHM 4300L	Laboratory in Biochemistry and Molecular Biology	2
MCB 3020	Basic Biology of Microorganisms	3
Gen Ed Composition; Writing Requirement		3
Gen Ed Humanities		3
	Credits	**14**
Semester Seven		
CHM 3610	Inorganic Chemistry	3
CHM 4413L	Biophysical Chemistry Laboratory	2
Approved Biochemistry elective		3
Gen Ed Humanities		3
Electives		4
	Credits	**15**

Semester Eight		
Approved Biochemistry elective		3
Gen Ed Social and Behavioral Sciences		6
Electives		7
	Credits	**16**
	Total Credits	**120**

1 CLAS Foreign Language Proficiency Requirement (https://catalog.ufl.edu/UGRD/colleges-schools/UGLAS/#degreerequirementstext)
2 Degree Requirements (https://catalog.ufl.edu/UGRD/colleges-schools/UGLAS/#degreerequirementstext)

Approved Electives

Code	Title	Credits
BCH 5413	Mammalian Molecular Biology and Genetics	3
CHM 3610L	Inorganic Chemistry Laboratory	2
CHM 4034	Advanced Biochemistry and Chemical Biology	4
CHM 4412	Physical Chemistry: Chemical Bonding and Spectroscopy	4
CHM 4611	Advanced Inorganic Chemistry	3
CHM 4671	Bioinorganic Chemistry	3
CHM 4130	Instrumental Analysis	5
& 4130L	and Instrumental Analysis Laboratory	
CHM 4230	Organic Spectroscopy	2
CHM 4272	The Organic Chemistry of Polymers	2
CHM 4304	Chemical Aspects of Cellular Control	3
MCB 4203	Bacterial Pathogens	3
MCB 4304	Genetics of Microorganisms	3
MCB 4403	Prokaryotic Cell Structure and Function	3
MCB 4503	General Virology	3
PCB 3063	Genetics	4
PCB 3134	Eukaryotic Cell Structure and Function	3
PCB 4233	Immunology	3
PCB 4522	Molecular Genetics	3
PHZ 4710	Introduction to Biological Physics	3

Academic Learning Compact

Chemistry is the study of matter: the structure and properties of matter, the transformations from one form of matter to another, and the energy transformations associated with these transformations.

Before Graduating Students Must

- Achieve at least 50% on the Diagnostic of Undergraduate Chemistry Knowledge (DUCK) exam.
- Obtain minimum grades of C in laboratory courses:

Code	Title	Credits
CHM 2211	Organic Chemistry 2	3
CHM 3120L	Analytical Chemistry Laboratory	1
CHM 4130L	Instrumental Analysis Laboratory	2
CHM 4411L	Physical Chemistry Laboratory	2
or CHM 4413L	Biophysical Chemistry Laboratory	

- Complete requirements for the baccalaureate degree, as determined by the chemistry faculty.

Students in the Major Will Learn to

Student Learning Outcomes | SLOs

Content

1.
   - **Standard Chemistry**
     Explain and apply facts, theories and concepts in
     i. physical
     ii. organic

iii. inorganic
iv. analytical chemistry

- **Biochemistry**
  Explain and apply facts, theories and concepts in
  i. physical
  ii. organic
  iii. inorganic
  iv. analytical chemistry
  v. biochemistry

2.

- **Standard Chemistry**
  Demonstrate and safely apply laboratory skills in
  i. synthetic
  ii. quantitative
  iii. instrumental methods as scientific approaches to gathering and verifying knowledge
- **Biochemistry**
  Apply laboratory skills in
  i. synthetic
  ii. quantitative
  iii. instrumental
  iv. biochemical methods as scientific approaches to gathering and verifying knowledge

Critical Thinking

3. **Standard Chemistry and Biochemistry**
   Interpret, evaluate, explain and critically assess theories and experimental results in chemistry or biochemistry.

Communication

4. **Standard Chemistry and Biochemistry**
   Collect, analyze and articulate results clearly and effectively in both oral and written formats.

Curriculum Map

I = Introduced; R = Reinforced; A = Assessed

Standard Chemistry

Courses	SLO 1-A	SLO 1-B	SLO 1-C	SLO 1-D	SLO 2-A	SLO 2-B	SLO 2-C	SLO 2-D	SLO 3	SLO 4
CHM 2045 and CHM 2046	I		I	I						
CHM 2211L					I, A					I
CHM 2212 and CHM 2213		I								
CHM 3120 and CHM 4130				R						
CHM 3120L						I, A	I			I
CHM 3610			R							
CHM 4130L						R	R, A		I	R, A
CHM 4411 and CHM 4412	R									
CHM 4411L						R	R		R	R, A
DUCK Exam	A	A	A	A						

Biochemistry

Courses	SLO 1-A	SLO 1-B	SLO 1-C	SLO 1-D	SLO 1-E	SLO 2-A	SLO 2-B	SLO 2-C	SLO 2-D	SLO 3	SLO 4
CHM 2045 and CHM 2046	I		I	I							
CHM 2211L						I, A					I
CHM 2212 and CHM 2213		I									
CHM 3120				R							
CHM 3120L							I, A	I			I
CHM 3218					I						
CHM 3400	R										
CHM 3610			R								
CHM 4300L									I		
CHM 4413L							R	R		R	R, A
DUCK Exam	A	A	A	A							

Assessment Types for Both Specializations

- Oral tests or reports
- Written reports
- Lab practicals