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 ([link](http://catalog.ufl.edu/UGRD/colleges-schools/UGLAS))
- **Degree**: Bachelor of Science
- **Specializations**: Biochemistry (p. 1) | General Chemistry ([link](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 Ph.D. degrees with specialization in all areas including biochemistry, nanotechnology, analytical, inorganic, organic, physical, polymer, synthetic and theoretical chemistry. The University of Florida ranks in the top five chemistry departments nationally in Ph.D. production ([link](http://pubs.acs.org/cen/acs/8747news1.pdf)) and is among the top 20 in bachelor's graduates.

Website ([link](https://www.chem.ufl.edu))

CONTACT

Email (chairadmin@chem.ufl.edu) | 352.392.0541 (tel) | 352.392.8758 (fax)

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

Curriculum

- Chemistry Minor
- Chemistry | Biochemistry

Students can choose the standard chemistry program, which is comparable to that offered in any major university, or the biochemistry program, 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/or presentations at scientific meetings.

Coursework for the Major

For either specialization (standard chemistry or biochemistry), all required courses must be completed within two attempts with minimum grades of C. Any foreign language acceptable to the college can be taken with this minimum program and language courses can be taken S-U. ENC 3254 is suggested to fulfill part of the university writing requirement.

Required Coursework

Required coursework will depend upon the program chosen. Coursework for each specialization can be found below under Critical Tracking and Model Semester Plan.

Course Details

**Introduction to General Chemistry**

CHM 1025, a two-credit course, is offered for students who need to strengthen their understanding of basic concepts of atomic structure and stoichiometry before beginning the general chemistry sequence:

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<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tr>
<td>CHM 2045 &amp; 2045L</td>
<td>General Chemistry 1 and General Chemistry 1 Laboratory</td>
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<tr>
<td>CHM 2046 &amp; 2046L</td>
<td>General Chemistry 2 and General Chemistry 2 Laboratory</td>
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A placement exam is offered via ONE.UF ([link](https://one.uf.edu)) and the score achieved determines whether CHM 1025 or CHM 2045 is the appropriate first course in chemistry.

General Chemistry

The following general chemistry offerings are available:

- CHM 1030/CHM 1031 is a terminal sequence for non-science students that presents chemistry from a medical and nursing perspective.
- CHM 1020 is a terminal general education course that explores chemistry in terms of society.
- CHM 2045/CHM 2045L and CHM 2046/CHM 2046L is the standard general chemistry sequence and is an acceptable preprofessional requirement for many science and engineering majors. Students are presumed to have good backgrounds in high school chemistry and mathematics (through MAC 1147) and are expected to pass the placement exam offered via ONE.UF ([link](https://one.uf.edu)) before registering for CHM 2045.
- CHM 2095/CHM 2045L and CHM 2096/CHM 2046L is an alternative general chemistry sequence especially designed for engineering majors.
- CHM 2047/CHM 2047L is a one-semester program for entering first-year students with strong backgrounds in chemistry, normally reflected by high AP or IB chemistry test scores. This program enables students to move more quickly into advanced work.
- CHM 2051 is offered as an alternative to CHM 2046 for students who have done particularly well in CHM 2045.
- CHM 2054L is a 2-credit, inquiry-based lab focusing on major concepts in chemistry and their application to quantitative life-sciences research. This course is equivalent to CHM 2045L and CHM 2046L or CHM 2047L.

Placement

For placement into the appropriate first course in chemistry, please refer to the Academic Advising section or consult a chemistry advisor. All students should complete their general chemistry studies at the same institution.

More Info ([link](http://catalog.ufl.edu/UGRD/academic-advising/placement))
Minors and/or Certificates

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 B.S. 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)

Related Chemistry Programs

- Bachelor of Arts in Interdisciplinary Studies, Biochemistry and Molecular Biology (http://catalog.ufl.edu/UGRD/colleges-schools/UGLAS/IDS_BA_BA)
- Chemistry minor (http://catalog.ufl.edu/UGRD/colleges-schools/UGLAS/CHY_UMN)

Biochemistry

The chemistry major with biochemistry specialization requires 61-69 credits, including the following coursework. With approval, this may include equivalent transfer coursework.

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<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<td>Required Foundation Coursework</td>
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<td>BSC 2010 &amp; 2010L</td>
<td>Integrated Principles of Biology 1 and Integrated Principles of Biology Laboratory 1</td>
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<tr>
<td>BSC 2011 &amp; 2011L</td>
<td>Integrated Principles of Biology 2 and Integrated Principles of Biology Laboratory 2</td>
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</tbody>
</table>

Select one option: 5-8

Option A

- CHM 2045 & 2045L | General Chemistry 1 and General Chemistry 1 Laboratory | |
- CHM 2046 & 2046L | General Chemistry 2 and General Chemistry 2 Laboratory | |

Option B

- CHM 2045 & 2045L | General Chemistry 1 and General Chemistry 1 Laboratory | |
- CHM 2051 & 2046L | Honors General Chemistry 2 and General Chemistry 2 Laboratory | |

Option C

- CHM 2047 & 2047L | One-Semester General Chemistry and One-Semester General Chemistry Laboratory | |
- CHM 3120 & 3120L | Introduction to Analytical Chemistry and Analytical Chemistry Laboratory | |
- MAC 2311 & 2312 | Analytic Geometry and Calculus 1 and Analytic Geometry and Calculus 2 | |

Select one option: 8-10

Option A

- PHY 2053 & 2053L | Physics 1 and Laboratory for Physics 1 | |
- PHY 2054 & 2054L | Physics 2 and Laboratory for Physics 2 | |

Option B

- PHY 2048 & 2048L | Physics with Calculus 1 and Laboratory for Physics with Calculus 1 | |

Required Core Coursework

Select one: 4-6

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<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tr>
<td>CHM 2212</td>
<td>Organic Chemistry 1 for Majors and CHM 2213 for Majors</td>
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<tr>
<td>CHM 2210</td>
<td>Organic Chemistry 1 and CHM 2211 for Majors</td>
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<td>CHM 3217</td>
<td>Organic Chemistry/Biochemistry 1</td>
<td>2</td>
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<td>CHM 3218</td>
<td>Organic Chemistry/Biochemistry 2</td>
<td>4</td>
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<td>CHM 3610</td>
<td>Inorganic Chemistry</td>
<td>3</td>
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<tr>
<td>CHM 3400 &amp; 4413L</td>
<td>Physical Chemistry for the Biosciences and Biophysical Chemistry Laboratory</td>
<td>5</td>
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<tr>
<td>CHM 4300L</td>
<td>Laboratory in Biochemistry and Molecular Biology</td>
<td>2</td>
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</table>

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.

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 (http://www.flvc.org/cpp/displayRecord.jsp?cip=400501&track=01) 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 requirement while in the process of taking the courses below. Students are also expected to complete the general education international (GE-N) and diversity (GE-D) requirements concurrently with another general education requirement (typically, GE-C, H, or S).

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.

<table>
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<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<td><strong>Semester One</strong></td>
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<tr>
<td>CHM 2045 &amp; 2045L</td>
<td>General Chemistry 1 and General Chemistry 1 Laboratory (Critical Tracking: State Core Gen Ed Physical Sciences)</td>
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<tr>
<td>MAC 2311</td>
<td>Analytic Geometry and Calculus 1 (Critical Tracking: State Core Gen Ed Mathematics)</td>
<td>4</td>
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<td>Quest 1 (Gen Ed Humanities)</td>
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<td>3</td>
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<td>State Core Gen Ed Composition (<a href="http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext">http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext</a>); Writing Requirement</td>
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| Credits | 14 |

Semester Two
- BSC 2010 & 2011L Integrated Principles of Biology 1 and Integrated Principles of Biology Laboratory 1 (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
- Foreign language 4-5

| Credits | 14-15 |

Semester Four
- 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 Physics 1 (Gen Ed Physical Sciences) 5
- Elective 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 Physics 2 (Gen Ed Physical Sciences) 5
- Elective (or foreign language if 4-3-3 option) 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
- Gen Ed Social and Behavioral Sciences 3
- Approved biochemistry elective 3
Students in the Major Will Learn to Student Learning Outcomes (SLOs)

**Content**

1. **Standard Chemistry**
   - Explain and apply facts, theories and concepts in
     - physical
     - organic
     - inorganic
     - analytical chemistry

2. **Biochemistry**
   - Explain and apply facts, theories and concepts in
     - physical
     - organic
     - inorganic
     - analytical chemistry
     - biochemistry

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

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

**Curriculum Map**

<table>
<thead>
<tr>
<th>Course</th>
<th>SLO 1-A</th>
<th>SLO 1-B</th>
<th>SLO 1-C</th>
<th>SLO 1-D</th>
<th>SLO 2-A</th>
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**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:
  - CHM 2211, Organic Chemistry 2
  - CHM 3120L, Analytical Chemistry Laboratory
  - CHM 4130L, Instrumental Analysis Laboratory
  - CHM 4411L, Physical Chemistry Laboratory
    - or CHM 4413L, Biophysical Chemistry Laboratory
- Complete requirements for the baccalaureate degree, as determined by the chemistry faculty.
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<tr>
<th>Course</th>
<th>SLO 1-A</th>
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<th>SLO 1-C</th>
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**Assessment Types for Both Specializations**

- Oral tests or reports
- Written reports
- Lab practicals