CHEMISTRY, B.S.CHEM

Learning Outcomes

• Students will explain basic and advanced chemistry concepts and apply them in problem-solving.
• Students will write effectively about chemistry concepts, principles, and processes.
• Students will apply basic computer programming and information retrieval skills to questions and problems in chemistry.
• Students will explain advanced chemistry topics and apply them in the chemical research process.

Admissions

Entrance Requirements

New freshmen who meet University admissions standards are eligible for admission to degree programs offered by the college. A student who wishes to enter the College of Arts and Sciences from another college on the Columbia campus must be in good standing and have a cumulative GPA of 2.00 or higher. A student who wishes to enter the College of Arts and Sciences from another UofSC campus must fulfill one of the following requirements:

1. Be in good standing, meet the admission requirements for a baccalaureate degree on the Columbia campus, and have a cumulative GPA of 2.00 or higher.
2. Be in good standing and have completed 30 semester hours with a GPA of 2.00 or higher on a UofSC campus.

Some programs in the College of Arts and Sciences have special admission requirements established by the department or committee that supervises the specific degree program, for example, Cardiovascular Technology, Biological Sciences, Chemistry, Biochemistry and Molecular Biology, Economics, Environmental Science, the Bachelor of Arts in Interdisciplinary Studies, and the Bachelor of Science in Interdisciplinary Studies. These requirements are listed in the sections of this bulletin that describe department and special degree programs.

Degree Requirements (120 hours)

Program of Study

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<th>Requirements</th>
<th>Credit Hours</th>
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<td>1. Carolina Core</td>
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<td>3. Program Requirements</td>
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Founding Documents Requirement

All undergraduate students must take a 3-credit course or its equivalent with a passing grade in the subject areas of History, Political Science, or African American Studies that covers the founding documents including the United States Constitution, the Declaration of Independence, the Emancipation Proclamation and one or more documents that are foundational to the African American Freedom struggle, and a minimum of five essays from the Federalist papers. This course may count as a requirement in any part of the program of study including the Carolina Core, the major, minor or cognate, or as a general elective. Courses that meet this requirement are listed here (https://academicbulletins.sc.edu/undergraduate/founding-document-courses/).

1. Carolina Core Requirements (34-46 hours)

CMW – Effective, Engaged, and Persuasive Communication: Written (6 hours)

must be passed with a grade of C or higher

• any CC-CMW courses (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

ARP – Analytical Reasoning and Problem Solving (8 hours)

• MATH 141
• MATH 142

SCI – Scientific Literacy (8 hours)

must be passed with a grade of C or higher

• PHYS 211 & PHYS 211L
• PHYS 212 & PHYS 212L

GFL – Global Citizenship and Multicultural Understanding: Foreign Language (0-6 hours)

Demonstration of proficiency in one foreign language equivalent to the minimal passing grade on the exit examination in the 122 course is required. Students can demonstrate this proficiency by successfully completing Phase II of the Proficiency Test or by successfully completing the 122 course, including the exit exam administered as part of that course.

• CC-GFL courses (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

It is strongly recommended that students continuing the study of a foreign language begin college-level study of that language in their first semester and continue in that language until their particular foreign language requirement is completed.

GHS – Global Citizenship and Multicultural Understanding: Historical Thinking (3 hours)

any CC-GHS course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

GSS – Global Citizenship and Multicultural Understanding: Social Sciences (3 hours)

any CC-GSS course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

AIU – Aesthetic and Interpretive Understanding (3 hours)

any CC-AIU course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

CMS – Effective, Engaged, and Persuasive Communication: Spoken Component 1 (0-3 hours)

any overlay or stand-alone CC-CMS course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)
INF – Information Literacy 1 (0-3 hours)
any overlay or stand-alone CC-INF course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

VSR – Values, Ethics, and Social Responsibility 1 (0-3 hours)
any overlay or stand-alone CC-VSR course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

1 Carolina Core Stand Alone or Overlay Eligible Requirements — Overlay-approved courses offer students the option of meeting two Carolina Core components in a single course. A maximum of two overlays is allowed. The total Carolina Core credit hours must add up to a minimum of 31 hours. Some programs may have a higher number of minimum Carolina Core hours due to specified requirements.

2. College Requirements (12-19 hours)
Foreign Language (0-3 hours)  
• only if needed to meet 122-level proficiency

Analytical Reasoning (3-7 hours)
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCE 145</td>
<td>Algorithmic Design I</td>
<td>4</td>
</tr>
<tr>
<td>or CSCE 206</td>
<td>Scientific Applications Programming</td>
<td></td>
</tr>
<tr>
<td>STAT 509</td>
<td>Statistics for Engineers</td>
<td>3</td>
</tr>
<tr>
<td>or STAT 515</td>
<td>Statistical Methods I</td>
<td></td>
</tr>
</tbody>
</table>

Total Credit Hours 7

Note: If CHEM 111, CHEM 112, CHEM 322, and CHEM 322L (or CHEM 141, CHEM 142, CHEM 322 and CHEM 322L) are all completed at USC, STAT 509 or STAT 515 is not required. Also, if CHEM 621 and CHEM 621L are completed, STAT 509 or STAT 515 is not required. Students who exempt STAT 509 or STAT 515 through this process will be required to take an approved elective to reach minimum hours for graduation.

History (3 hours)
The College of Arts and Sciences requires one additional GHS course beyond the Carolina Core GHS requirement.

• If the Carolina Core GHS requirement is fulfilled by a U.S. history course, the College of Arts and Sciences history requirement must be fulfilled by a non-U.S. history course.
• If the Carolina Core GHS requirement is fulfilled by a non-U.S. history course, the College of Arts and Sciences history requirement must be fulfilled by a U.S. history course.

Please select the College of Arts and Sciences history requirement from the approved list of U.S. and non-U.S. history courses (https://academicbulletins.sc.edu/undergraduate/arts-sciences/history-requirement/).

Social Science and Fine Arts or Humanities (6 hours)
• Courses Acceptable for Social Science and Fine Arts or Humanities Credit in Degree Programs in the College of Arts and Sciences (https://academicbulletins.sc.edu/undergraduate/arts-sciences/courses-acceptable-social-science-fine-arts-humanities/)

• Three hours of Social Science
• Three hours of Fine Arts or Humanities

3. Program Requirements (26-37 hours)
Supporting Courses (14 hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 241</td>
<td>Vector Calculus</td>
<td>3</td>
</tr>
<tr>
<td>One MATH course beyond MATH 241</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Select one of the following options:</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>CHEM 141</td>
<td>Principles of Chemistry I &amp; 142</td>
<td></td>
</tr>
<tr>
<td>CHEM 111</td>
<td>General Chemistry I &amp; 111L &amp; 112 &amp; 112L</td>
<td></td>
</tr>
</tbody>
</table>

Total Credit Hours 14

Cognate (12 hours)
The cognate is intended to support the course work in the major. The cognate must consist of twelve (12) hours of courses at the advanced level, outside of but related to the major. The cognate may be taken in one or more departments or programs, depending on the interests of the student and the judgment of the advisor.

Courses offered by departments and programs that are acceptable for cognate credit are outlined in the section titled Courses Acceptable for Cognate Credit in Degree Programs in the College of Arts and Sciences (https://academicbulletins.sc.edu/undergraduate/arts-sciences/courses-acceptable-cognate/).

For cognate course offerings in other colleges, consult the appropriate sections of this bulletin. Some major programs have specific cognate requirements.

It should be emphasized that the cognate is not a second set of elective courses to be chosen at random by the student. The cognate must be approved by the major advisor as being related to the major field of study. Students are urged to consult their major advisors for specific requirements in their major.

Courses applied toward general education requirements cannot be counted toward the cognate.

For Bachelor of Science degrees, grades of D are acceptable for completion of the cognate requirement, except where restricted by the major program.

Minor (18 hours) optional
In place of the cognate a student in the College of Arts and Sciences may choose a minor consisting of at least 18 credit hours of prescribed courses. (Some minors in the sciences require a minimum of 16 hours.) The subject area of the minor may be related to the major.

Students pursuing interdisciplinary minors who wish to use courses in their major department for minor credit must petition the College Committee on Scholastic Standards and Petitions for permission to do so.

The minor is intended to develop a coherent basic preparation in a second area of study. It differs from the cognate inasmuch as the courses must be concentrated in one area and must follow a structured
sequence. Interdisciplinary minors can be designed with the approval of the assistant dean for academic affairs and advising.

Courses applied toward general education requirements cannot be counted toward the minor. No course may satisfy both major and minor requirements. All minor courses must be passed with a grade of C or higher. At least half of the courses in the minor must be completed in residence at the University.

Minors are available in participating departments of the College of Arts and Sciences and in other colleges. For descriptions of specific minors, students should see the appropriate sections of the bulletin.

A list of minor programs of study can be found at Programs A-Z (https://academicbulletins.sc.edu/undergraduate/programs-az/).

**Electives (0-11 hours)**

No courses of a remedial, developmental, skill-acquiring, or vocational nature may apply as credit toward degrees in the College of Arts and Sciences. The College of Arts and Sciences allows the use of the Pass-Fail option on elective courses. Further clarification on inapplicable courses can be obtained from the College of Arts and Sciences.

**4. Major Requirements (37-38 hours)**

A minimum grade of C is required in all major courses

**Major Courses (37-38 hours)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 322</td>
<td>Analytical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 322L</td>
<td>Analytical Chemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 333</td>
<td>Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 333L</td>
<td>Comprehensive Organic Chemistry Laboratory I</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 334</td>
<td>Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 334L</td>
<td>Comprehensive Organic Chemistry Laboratory II</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 511</td>
<td>Inorganic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 541</td>
<td>Physical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 541L</td>
<td>Physical Chemistry Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 542</td>
<td>Physical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 542L</td>
<td>Physical Chemistry Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 550</td>
<td>Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>or CHEM 555</td>
<td>Biochemistry/Molecular Biology I</td>
<td></td>
</tr>
<tr>
<td>CHEM 621</td>
<td>Instrumental Analysis</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 621L</td>
<td>Instrumental Analysis Lab</td>
<td>1</td>
</tr>
<tr>
<td>3 credit of undergraduate research (in an approved area of biochemistry or inorganic chemistry)</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

**Total Credit Hours** 37

If the undergraduate research is not in an approved area of biochemistry or inorganic chemistry, CHEM 550L must be taken.

Note: Students who transfer into the program after completion of CHEM 331L and CHEM 332L, may meet the organic chemistry requirements by completing CHEM 334L.

**Major Map**

A major map is a layout of required courses in a given program of study, including critical courses and suggested course sequences to ensure a clear path to graduation.