CHEMISTRY, BS

Degree: Bachelor of Science (BS)
Major: Chemistry

Program Overview
The BS program in chemistry is designed for students who seek professional careers in the chemical sciences and is certified by the American Chemical Society. The BS curriculum provides a rigorous background in chemistry, yet offers considerable flexibility in the senior year in the choice of electives, allowing BS majors to pursue areas of chemistry of particular interest to them in greater depth. At least 3 credit hours of research (CHEM 397 / CHEM 398) are required, and up to 9 credit hours of research may be credited toward the degree.

Learning Outcomes
- Students will be able to demonstrate proficiency in the content knowledge of the main sub disciplines of chemistry including general, organic, analytical, physical, inorganic, and biochemistry.
- Students will be able to solve chemistry problems, and design, carry out, record and analyze the results of chemical experiments.
- Students will be able to utilize peer-reviewed scientific literature effectively, and evaluate technical articles critically.
- Students will be able to design and carry out experiments in a safety-focused manner.
- Students will be able to utilize ethically sound judgements when working with scientific results.

Undergraduate Policies
For undergraduate policies and procedures, please review the Undergraduate Academics section of the General Bulletin.

Accelerated Master's Programs
Undergraduate students may participate in accelerated programs toward graduate or professional degrees. For more information and details of the policies and procedures related to accelerated studies, please visit the Undergraduate Academics section of the General Bulletin.

Program Requirements
Students seeking to complete this major and degree program must meet the general requirements for bachelor's degrees and the Unified General Education Requirements. Students completing this program as a secondary major while completing another undergraduate degree program do not need to satisfy the school-specific requirements associated with this major.

Required Chemistry Courses

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CHEM 105</td>
<td>Principles of Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 113</td>
<td>Principles of Chemistry Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 106</td>
<td>Principles of Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 304</td>
<td>Quantitative Analysis Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 310</td>
<td>Foundations of Analytical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 323</td>
<td>Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 311</td>
<td>Inorganic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 322</td>
<td>Laboratory Methods in Organic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 324</td>
<td>Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 331</td>
<td>Laboratory Methods in Inorganic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 335</td>
<td>Physical Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 332</td>
<td>Laboratory Methods in Physical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 336</td>
<td>Physical Chemistry II</td>
<td>3</td>
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</tbody>
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Research Requirement

CHEM 397 Undergraduate Research 3 - 6
or CHEM 398 Undergraduate Research/Senior Capstone Project

Biochemistry Requirement

Choose one of the following: 3-4
- CHEM 328 Introductory Biochemistry I
- CHEM 329 Biochemistry II: Living Systems
- BIOC 307 Introduction to Biochemistry: From Molecules To Medical Science

Chemistry Electives a 6-8
Technical Electives b 6-8
Total Hours 55

a The chemistry elective may be any chemistry department course at the 300 level or above which is not part of the "core set," or selected courses with a strong chemistry content at the 300 level or above from other science departments. Only 3 credit hours of CHEM 397 may be applied as a chemistry elective.
b The technical electives may be chosen more widely from any of the physical sciences, math, or engineering courses. An additional 6 credit hours of CHEM 397 may be taken as technical electives. Further additional units of CHEM 397 may be taken as free electives. Students may wish to group their electives into "tracks" of specialization in order to tailor their degree to a particular area of chemistry.

Additional Required Courses

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<tr>
<th>Code</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>MATH 121</td>
<td>Calculus for Science and Engineering I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 122</td>
<td>Calculus for Science and Engineering II</td>
<td>4</td>
</tr>
<tr>
<td>or MATH 124</td>
<td>Calculus II</td>
<td></td>
</tr>
<tr>
<td>MATH 223</td>
<td>Calculus for Science and Engineering III</td>
<td>3</td>
</tr>
<tr>
<td>or MATH 227</td>
<td>Calculus III</td>
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<tr>
<td>PHYS 121</td>
<td>General Physics I - Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>or PHYS 123</td>
<td>Physics and Frontiers I - Mechanics</td>
<td></td>
</tr>
<tr>
<td>PHYS 122</td>
<td>General Physics II - Electricity and Magnetism</td>
<td>4</td>
</tr>
<tr>
<td>or PHYS 124</td>
<td>Physics and Frontiers II - Electricity and Magnetism</td>
<td></td>
</tr>
<tr>
<td>PHYS 221</td>
<td>Introduction to Modern Physics</td>
<td>3</td>
</tr>
<tr>
<td>MATH 224</td>
<td>Elementary Differential Equations</td>
<td></td>
</tr>
<tr>
<td>MATH 228</td>
<td>Differential Equations</td>
<td></td>
</tr>
<tr>
<td>STAT 312</td>
<td>Basic Statistics for Engineering and Science</td>
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Total Hours 25
Advanced Coursework
BS majors who plan to go on to graduate study may elect to take advanced courses in:

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<tr>
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<tbody>
<tr>
<td>CHEM 412</td>
<td>Advanced Inorganic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 421</td>
<td>Advanced Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 435</td>
<td>Synthetic Methods in Organic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 406</td>
<td>Chemical Kinetics</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 446</td>
<td>Quantum Mechanics I</td>
<td>3</td>
</tr>
</tbody>
</table>

Students can also elect to take other graduate offerings. Interdisciplinary strengths can be achieved by selecting technical electives in biochemistry, biomedical engineering, chemical engineering, macromolecular science, and materials science as well as in biology; earth, environmental, and planetary sciences; mathematics, applied mathematics, and statistics; and physics.

Sample Plan of Study

First Year

**Fall**

- CHEM 105 Principles of Chemistry I 3
- CHEM 113 Principles of Chemistry Laboratory 2
- MATH 121 Calculus for Science and Engineering I 4
- Academic Inquiry Seminar, Breadth, or Elective course a 3
- CHEM Elective 3

**Hours** 15

**Spring**

- CHEM 106 Principles of Chemistry II 3
- MATH 122 Calculus for Science and Engineering II or Calculus II 4
- PHYS 121 General Physics I - Mechanics or Physics and Frontiers I - Mechanics 4
- Academic Inquiry Seminar, Breadth, or Elective course a 3
- CHEM Elective 3

**Hours** 15

Second Year

**Fall**

- CHEM 304 Quantitative Analysis Laboratory 2
- CHEM 310 Foundations of Analytical Chemistry 3
- CHEM 323 Organic Chemistry I 3
- PHYS 122 General Physics II - Electricity and Magnetism or Physics and Frontiers II - Electricity and Magnetism 4
- Breadth, or Elective course a 3

**Hours** 15

**Spring**

- CHEM 311 Inorganic Chemistry I 3
- CHEM 322 Laboratory Methods in Organic Chemistry 3
- CHEM 324 Organic Chemistry II 3

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PHYS 221 Introduction to Modern Physics 3
Breadth, or Elective course a 3

**Third Year**

**Fall**

- CHEM 331 Laboratory Methods in Inorganic Chemistry 3
- CHEM 335 Physical Chemistry I 3
- MATH 223 or MATH 227 Calculus for Science and Engineering III or Calculus III 3
- Breadth, or Elective course a 3
- CHEM Elective 3

**Hours** 15

**Spring**

- CHEM 332 Laboratory Methods in Physical Chemistry 3
- CHEM 336 Physical Chemistry II 3
- MATH 224 or MATH 228 or STAT 312 Elementary Differential Equations or Differential Equations or Basic Statistics for Engineering and Science 3

300-level CHEM Elective 3
Breadth, or Elective course a 3

**Hours** 15

**Fourth Year**

**Fall**

- CHEM 398 Undergraduate Research/Senior or CHEM 397 Capstone Project or Undergraduate Research 3 - 6
- CHEM Electives 6
- Breadth, or Elective course a 3

**Hours** 15 - 19

**Spring**

- Breadth, or Elective course a 3
- Technical Electives 6
- Open Electives 6

**Hours** 15

**Total Hours** 122 - 126

a Unified General Education Requirement.