CHEMISTRY MAJOR (B.S.)

https://ceps.unh.edu/chemistry/program/bs/chemistry-major

Description

Chemistry Major (B.S.) Description

The B.S. Chemistry degree is certified by the American Chemical Society and provides a deep, rigorous experience that prepares students for graduate work or a career in chemical industry and related fields. The curriculum offers thorough training in the major fields of chemistry, covering analytical, inorganic, organic, and physical chemistry, as well as biochemistry. Students gain laboratory experience in molecular synthesis and characterization, analytical and instrumental methods, physical chemical measurements and data analysis, and spectroscopy. At the same time, the program requires students to participate in scientific inquiry, via both advanced laboratory experiences and independent research.

Requirements

Required Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CHEM 400</td>
<td>Freshman Seminar</td>
<td>1</td>
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<tr>
<td>CHEM 403</td>
<td>General Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 404</td>
<td>General Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 517</td>
<td>Quantitative Analysis</td>
<td>5</td>
</tr>
<tr>
<td>&amp; CHEM 518</td>
<td>Quantitative Analysis Laboratory</td>
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<tr>
<td>CHEM 547</td>
<td>Organic Chemistry I</td>
<td>5</td>
</tr>
<tr>
<td>&amp; CHEM 549</td>
<td>Organic Chemistry Laboratory</td>
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<tr>
<td>CHEM 548</td>
<td>Organic Chemistry II</td>
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<tr>
<td>&amp; CHEM 550</td>
<td>and Organic Chemistry Laboratory</td>
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<tr>
<td>CHEM 574</td>
<td>Chemistry Across the Periodic Table</td>
<td>6</td>
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<tr>
<td>&amp; CHEM 576</td>
<td>and Experimental Inorganic Chemistry</td>
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<tr>
<td>BMCB 658</td>
<td>General Biochemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 683</td>
<td>Physical Chemistry I</td>
<td>5</td>
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<tr>
<td>&amp; CHEM 685</td>
<td>and Physical Chemistry Laboratory</td>
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<tr>
<td>CHEM 684</td>
<td>Physical Chemistry II</td>
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<tr>
<td>&amp; CHEM 686</td>
<td>and Physical Chemistry Laboratory</td>
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<tr>
<td>CHEM 755</td>
<td>Advanced Organic Chemistry</td>
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<tr>
<td>CHEM 762</td>
<td>Instrumental Methods of Chemical Analysis</td>
<td>5</td>
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<tr>
<td>&amp; CHEM 763</td>
<td>and Instrumental Methods of Chemical Analysis Laboratory</td>
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<tr>
<td>CHEM 774</td>
<td>Inorganic Chemistry</td>
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<tr>
<td>CHEM 776</td>
<td>Physical Chemistry III</td>
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</tr>
<tr>
<td>CHEM 777</td>
<td>Advanced Synthesis and Characterization</td>
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<tr>
<td>CHEM 798</td>
<td>Senior Seminar</td>
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<tr>
<td>CHEM 799</td>
<td>Senior Thesis</td>
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<tr>
<td>MATH 425</td>
<td>Calculus I</td>
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<tr>
<td>MATH 426</td>
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<td>PHYS 407</td>
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<tr>
<td>PHYS 408</td>
<td>General Physics II</td>
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</table>

Total Credits: 85

1 BMCB 658 General Biochemistry satisfies the Discovery Biological Sciences requirement (for BS Chem majors only).

2 CHEM 799 Senior Thesis is a year-long experience of 4 credits per semester and satisfies the Discovery Capstone Experience requirement.

Degree Plan

This is the suggested degree plan for B.S. Chemistry majors. A student can alter this plan in consultation with an academic adviser.

Course   Title             Credits
Fall
CHEM 400 | Freshman Seminar        | 1
CHEM 403 | General Chemistry I     | 4
MATH 425 | Calculus I               | 4
PHYS 407 | General Physics I       | 4
Discovery Course

Credits: 17

Total Credits: 17

First Year

Course   Title             Credits
Spring
CHEM 404 | General Chemistry II    | 4
MATH 426 | Calculus II              | 4
ENGL 401 | First-Year Writing      | 4
PHYS 408 | General Physics II      | 4

Credits: 16

Total Credits: 16

Second Year

Course   Title             Credits
Fall
CHEM 517 | Quantitative Analysis   | 4
CHEM 518 | Quantitative Analysis Laboratory | 1
CHEM 547 | Organic Chemistry I     | 3
CHEM 549 | Organic Chemistry Laboratory | 2
Discovery Courses (2 courses at 4 credits each) | 8

Credits: 18

Total Credits: 18

Spring

Course   Title             Credits
CHEM 574 | Inorganic Chemistry     | 3
CHEM 777 | Physical Chemistry III  | 3
CHEM 778 | Advanced Synthesis and Characterization | 3
CHEM 799 | Senior Thesis           | 8
MATH 426 | Calculus II              | 4
PHYS 407 | General Physics I       | 4
PHYS 408 | General Physics II      | 4

Credits: 15

Total Credits: 15

Third Year

Course   Title             Credits
Fall
CHEM 683 | Physical Chemistry I    | 3
CHEM 685 | Physical Chemistry Laboratory | 2
CHEM 755 | Advanced Organic Chemistry | 3
Chemistry Major (B.S.)

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>CHEM 774</td>
<td>Inorganic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 777</td>
<td>Advanced Synthesis and Characterization</td>
<td>3</td>
</tr>
<tr>
<td>Discovery Course</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td><strong>Credits</strong></td>
<td></td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>

**Course Title Credits
Third Year Spring
CHEM 684 Physical Chemistry II 3
CHEM 686 Physical Chemistry Laboratory 2
CHEM 762 Instrumental Methods of Chemical Analysis 3
CHEM 763 Instrumental Methods of Chemical Analysis Laboratory 2
Elective Course 4
Discovery Course 4

**Credits** 18

**Course Title Credits
Fourth Year Fall
CHEM 776 Physical Chemistry III 3
CHEM 799 Senior Thesis ([first semester of a yearlong experience]) 4
BMCB 658 General Biochemistry 3
Elective Course 4

**Credits** 14

**Course Title Credits
Fourth Year Spring
CHEM 798 Senior Seminar 1
CHEM 799 Senior Thesis ([second semester of a yearlong experience]) 4
Elective Courses (2 courses at 4 credits each) 8

**Credits** 13

**Course Title Credits
Total Credits

Student Learning Outcomes

- Reason with Chemistry’s anchoring concepts: that matter consists of atoms that have internal structures that dictate their chemical and physical behavior; that atoms interact via electrostatic forces to form chemical bonds that chemical compounds have geometric structures that influence their chemical and physical behaviors; that intermolecular forces—electrostatic forces between molecules—dictate the physical behavior of matter; that matter changes, forming products that have new chemical and physical properties that energy is the key currency of chemical reactions in molecular scale systems as well as macroscopic systems; that chemical changes have a time scale over which they occur; that all chemical changes are, in principle, reversible, and chemical processes often reach a state of dynamic equilibrium; that Chemistry is generally advanced via experimental observations; and that Chemistry constructs meaning interchangeably at the particulate and macroscopic levels.

- Use Chemistry’s cross-cutting concepts to interrogate and explain phenomena: chemical identity (how do we identify chemical substances?); structure-property relationships (how do we predict the properties of materials?); chemical causality (why do chemical processes occur?); chemical mechanism (how do chemical processes occur?); chemical control (how can we control chemical processes?); benefits-costs-risks (how do we evaluate the impacts of chemically transforming matter?).

- Demonstrate the following general scientific practices when displaying knowledge of chemical ideas and concepts: asking questions; developing and using models; constructing explanations; planning and carrying out investigations; engaging in argument from evidence; analyzing and interpreting data; using mathematics and computational thinking; obtaining, evaluating, and communicating information OR demonstrate the following Chemistry core practices when displaying knowledge of chemical ideas and concepts (a) analysis: development and application of strategies for detecting, identifying, separating, and quantifying chemical substances (b)synthesis: the design of new substances and synthetic routes (c)transformation: controlling chemical processes for non-synthetic purposes.