Requirements for the Chemistry Major

The Chemical Sciences major consists of 25-27 courses (12 lower division and 13-15 upper division, depending on emphasis track) designed to give all students a common foundation of core knowledge specific to the discipline.

Lower Division Major Requirements [46 Units]

- BIO 001: Contemporary Biology [4 units] *
- CHEM 002: General Chemistry I [4 units] or
- CHEM 002H: Honors General Chemistry I [4 units]
- CHEM 010: General Chemistry II [4 units] or
- CHEM 010H: Honors General Chemistry II [4 units]
- CHEM 008: Principles of Organic Chemistry [3 units] and
- CHEM 008L: Principles of Organic Chemistry Lab [1 unit] or
- CHEM 008H: Honors Principles of Organic Chemistry [4 units]
- CSE 020: Introduction to Computing I [2 units] **
- MATH 021: Calculus I for Physical Sciences and Engineering [4 units]
- MATH 022: Calculus II for Physical Sciences and Engineering [4 units]
- MATH 023: Vector Calculus [4 units]
- MATH 024: Linear Algebra and Differential Equations [4 units]
- MATH 032: Probability and Statistics [4 units]
- PHYS 008: Introductory Physics I for Physical Sciences [4 units] or
- PHYS 008H: Honors Introductory Physics I for Physical Sciences [4 units]
- PHYS 009: Introductory Physics II for Physical Sciences [4 units] or
- PHYS 009H: Honors Introductory Physics II for Physical Sciences [4 units]

* BIO 001L is recommended but not required.

** MATH 015 or CSE 005 may be taken in place of CSE 020.
Upper Division Major Requirements [28 Units]

- CHEM 100: Organic Synthesis and Mechanism [3 units]
- CHEM 101L: Advanced Synthetic Laboratory [2 units]
- CHEM 111: Biochemistry I [4 units] or
  BIO 101: Biochemistry I [4 units]
- CHEM 112: Quantum Chemistry and Spectroscopy [3 units]
- CHEM 113: Chemical Thermodynamics and Kinetics [3 units]
- CHEM 115: Instrumental Analysis and Bioanalytical Chemistry [3 units]
- CHEM 120: Inorganic Chemistry [3 units]
- CHEM 150: Inorganic and Materials Chemistry Laboratory [2 units]
- CHEM 153: Physical Chemistry Laboratory [2 units]
- CHEM 155: Instrumental Analysis Laboratory [2 units]
- CHEM 194: Ethics and Communication in Chemistry [1 unit]

Chemistry Emphasis Track Requirements

Any two of the following in-depth course electives:

- Any other 3- or 4-unit CHEM course numbered 100-189 [3 or 4 units]
- Any 200-level CHEM course (instructor approval required) [3 units]
- ESS 100: Environmental Chemistry [4 units]
- MSE 110: Solid State Materials Properties [4 units]
- MSE 118: Introduction to Nanotechnology and Nanoscience [3 units]

Biological Chemistry Emphasis Requirements

- BIO 102: Advanced Biochemistry and Molecular Biology [4 units] or
  CHEM 122: Advanced Biochemistry and Molecular Biology [4 units]
- Two other upper division biology courses [7-8 units]

AND

One of the following in-depth course electives:
• Any other 3- or 4-unit CHEM course numbered 100-189 [3 or 4 units]
• Any 200-level CHEM course (instructor approval required) [3 units]
• ESS 100: Environmental Chemistry [4 units]
• MSE 118: Introduction to Nanotechnology and Nanoscience [3 units]

Materials Chemistry Emphasis Requirements

• ENGR 045: Introduction to Materials [4 units]

AND

One of the following materials electives:

• CHEM 140: Nanoscale Materials Chemistry [3 units]
• ENGR 170: Introduction to Electron Microscopy [3 units]
• MSE 110: Solid State Materials Properties [4 units]
• MSE 113: Materials Characterization [4 units]
• MSE 114: Polymeric Materials [4 units]
• MSE 115: Ceramic Materials [3 units]
• MSE 116: Composites [3 units]
• MSE 118: Introduction to Nanotechnology and Nanoscience [3 units]
• MSE 119: Materials Simulations [3 units]

AND

One of the following in-depth course electives:

• Any other 3- or 4-unit CHEM course numbered 100-189 [3 or 4 units]
• Any 200-level CHEM course (instructor approval required) [3 units]
• ESS 100: Environmental Chemistry [4 units]
Transfer Students

To be admitted to the Chemical Sciences major transfer students must meet the following requirements:

Applicants will, at the time of admission have completed at minimum each of the following courses (or their equivalent) with a “C-” or better:

- **CHEM 002**: General Chemistry I [4 units]
- **CHEM 010**: General Chemistry II [4 units]
- **MATH 021**: Calculus I for Physical Sciences and Engineering [4 units]
- **MATH 022**: Calculus II for Physical Sciences and Engineering [4 units]
- **PHYS 008**: Introductory Physics I for Physical Sciences [4 units]
- **PHYS 009**: Introductory Physics II for Physical Sciences [4 units]
This chart is meant to guide students in the proper sequencing of course work. This list is not exhaustive and subject to change. Students should refer to the current schedule of classes for current course prerequisites.
This sample plan demonstrates the recommended sequencing and timing of the required and elective components within the major.

In many cases, a student’s academic background will require variations in the timing of the coursework listed in the plan.

All students are expected to work with their academic advisor to find their best pathway through the degree requirements of their chosen program.
This sample plan demonstrates the recommended sequencing and timing of the required and elective components within the major.

In many cases, a student’s academic background will require variations in the timing of the coursework listed in the plan.

All students are expected to work with their academic advisor to find their best pathway through the degree requirements of their chosen program.
This sample plan demonstrates the recommended sequencing and timing of the required and elective components within the major.

In many cases, a student’s academic background will require variations in the timing of the coursework listed in the plan.

All students are expected to work with their academic advisor to find their best pathway through the degree requirements of their chosen program.

---

**Sample Plan and Course Flow Chart Template – Chem-Materials**

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semester 1</td>
<td>Semester 2</td>
<td>Semester 3</td>
<td>Semester 4</td>
</tr>
<tr>
<td>(14 Units)</td>
<td>(16 Units)</td>
<td>(16 Units)</td>
<td>(15 Units)</td>
</tr>
<tr>
<td><strong>CHEM 02/02H</strong></td>
<td><strong>CHEM 10</strong></td>
<td><strong>CHEM 08/08H &amp; 08L</strong></td>
<td><strong>CHEM 100</strong></td>
</tr>
<tr>
<td>General Chemistry I</td>
<td>General Chemistry II</td>
<td>Organic Chemistry I</td>
<td>Organic Synthesis and Mechanism</td>
</tr>
<tr>
<td>(4 units)</td>
<td>(4 units)</td>
<td>(4 units)</td>
<td>(3 units)</td>
</tr>
<tr>
<td><strong>SPARK</strong></td>
<td><strong>WRI 10</strong></td>
<td><strong>Approaches to Knowledge Area B</strong></td>
<td><strong>Approaches to Knowledge Area B</strong></td>
</tr>
<tr>
<td>Seminar (4 units)</td>
<td>College Reading &amp; Composition (4 units)</td>
<td>(4 units)</td>
<td>(4 units)</td>
</tr>
<tr>
<td><strong>MATH 21</strong></td>
<td><strong>MATH 22</strong></td>
<td><strong>MATH 023</strong></td>
<td><strong>MATH 024</strong></td>
</tr>
<tr>
<td>Calculus I for Physical Sciences &amp; Engineering (4 units)</td>
<td>Calculus II for Physical Sciences &amp; Engineering (4 units)</td>
<td>Vector Calculus (4 units)</td>
<td>Linear Algebra &amp; Differential Equations (4 units)</td>
</tr>
<tr>
<td><strong>CSE 005/020</strong></td>
<td><strong>PHYS 08/08H</strong></td>
<td><strong>PHYS 09/09H</strong></td>
<td><strong>MATH 032</strong></td>
</tr>
<tr>
<td>Computer Science Requirement (2 units)</td>
<td>Introductory Physics I (4 units)</td>
<td>Introductory Physics II (4 units)</td>
<td>Probability and Statistics (4 units)</td>
</tr>
<tr>
<td><strong>Year 2</strong></td>
<td><strong>Year 3</strong></td>
<td><strong>Year 4</strong></td>
<td><strong>Year 5</strong></td>
</tr>
<tr>
<td>Semester 3</td>
<td>Semester 4</td>
<td>Semester 5</td>
<td>Semester 6</td>
</tr>
<tr>
<td>(16 Units)</td>
<td>(15 Units)</td>
<td>(18 Units)</td>
<td>(24 Units)</td>
</tr>
<tr>
<td><strong>CHEM 101L</strong></td>
<td><strong>CHEM 112</strong></td>
<td><strong>CHEM 101</strong></td>
<td><strong>CHEM 113</strong></td>
</tr>
<tr>
<td>Advanced Synthetic Lab (2 units)</td>
<td>Quantum Chemistry and Spectroscopy (4 units)</td>
<td>Contemporary Biology (4 units) *Lab recommended, not required</td>
<td>Chemical Thermodynamics and Kinetics (4 units)</td>
</tr>
<tr>
<td><strong>ENGR 45</strong></td>
<td><strong>BIO 01</strong></td>
<td><strong>Free Elective</strong></td>
<td><strong>CHEM 153</strong></td>
</tr>
<tr>
<td>Introduction to Materials (4 units)</td>
<td></td>
<td>(4 units)</td>
<td>Physical Chemistry Lab (2 units)</td>
</tr>
<tr>
<td><strong>CHEM 115</strong></td>
<td><strong>Free Elective</strong></td>
<td><strong>Approaches to Knowledge Area B</strong></td>
<td><strong>CHEM 135</strong></td>
</tr>
<tr>
<td>Instrumental Analysis (3 units)</td>
<td>(4 units)</td>
<td>(4 units)</td>
<td>Instrumental Lab (2 units)</td>
</tr>
</tbody>
</table>
| | | | **UD Materials Science Emphasis Elective** (4 units)
| **CHEM 150** | **CHEM 111/BIO 101** | **CHEM 120** | **CHEM 155** |
| Inorganic Lab (2 units) | Biochemistry I (4 units) *Crossroads Course | Inorganic Chemistry (3 units) | |