Department of Chemistry

Information for Prospective Concentrators

Fall 2022

Course Offerings for AY 2022-2023

Fall 2022
✦ CHM 201: General Chemistry I
✦ CHM 207: Advanced General Chemistry - Materials Chemistry
✦ CHM 301: Organic Chemistry I: Biological Emphasis

Spring 2023
✦ CHM 202: General Chemistry II
✦ CHM 215: Advanced General Chemistry – Honors
✦ CHM 304: Organic Chemistry II: Foundations of Chemical Reactivity and Synthesis

AP Credit and Placement
Chemistry Major Requirements

Prerequisites – Must be completed before Junior Fall
✦ One year General Chemistry or equivalent.
  o CHM 201 & 202
  o CHM 207 & 202
  o One unit placement credit & CHM 215
  o One unit placement credit & CHM 202
  o Two units placement credit
✦ One year college calculus such as MAT 103 & MAT 104, equivalent.
✦ One year college physics such as PHY 101 & PHY 102, or PHY 103 & PHY 104, or equivalent
✦ One year Organic Chemistry. CHM 301 (F) & CHM 304 (S). These courses must be taken for a grade at Princeton, as they count as Departmental Courses.

Sample schedules for prospective 1st and 2nd year chemistry majors

No Placement Credit in CHM or MAT

<table>
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<tr>
<th>Year</th>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td>1st Year</td>
<td>CHM 201/207</td>
<td>CHM 202</td>
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<tr>
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<td>MAT 103</td>
<td>MAT 104</td>
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<td>2nd Year</td>
<td>CHM 301</td>
<td>CHM 304</td>
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<td>PHY 101/103</td>
<td>PHY 102/104</td>
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1 unit Placement Credit in CHM and 1 unit Placement in MAT

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<th>Year</th>
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<th>Spring</th>
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<tbody>
<tr>
<td>1st Year</td>
<td>MAT 104</td>
<td>CHM 215</td>
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<td>PHY 101/103</td>
<td>PHY 102/104</td>
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<tr>
<td>2nd Year</td>
<td>CHM 301</td>
<td>CHM 304</td>
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<td>CHM 373</td>
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2 units Placement Credit in CHM and 2 units Placement in MAT

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<th>Year</th>
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<tr>
<td>1st Year</td>
<td>CHM 301</td>
<td>CHM 304</td>
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<tr>
<td>2nd Year</td>
<td>CHM 411</td>
<td>CHM 373</td>
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<td>PHY 101/103</td>
<td>PHY 102/104</td>
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Departmental Courses
Eight departmental courses: 4 Core courses and 4 Cognate Courses

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<tr>
<th>Core Courses</th>
<th>Cognate Courses**</th>
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| ✦ Organic Chemistry - 1 semester  
  CHM 301 (F), 302 (S), 304 (S) | ✦ Non-introductory course |
| ✦ Core Lab - 1 semester  
  CHM 371, MSE 302 | ✦ Courses must have prerequisites |
| ✦ Physical Chemistry - 1 semester  
  CHM 305 (F), 306 (S), 406 (S) | Courses may include:  
  ✦ 200 level and higher: MAT and PHY  
  ✦ 300 level and higher: CHM, MSE, QCB,  
    and some MOL, GEO, EEB, and  
    Engineering courses. |
| ✦ Inorganic Chemistry - 1 semester  
  CHM 411 (F), CHM 412 (S) | **Courses are evaluated on an individual  
    basis, and the course must have strong  
    chemistry component. Policy courses do  
    not meet the requirement. |

Experimental Chemistry

The Department of Chemistry recently revamped our Experimental chemistry undergraduate course offerings. Experimental chemistry now consists of two courses, CHM 371 and CHM 373. Concurrent enrollment or prior completion of CHM 373 is required for CHM 371. The overarching goal of these courses is to learn the art of designing experiments for independent inquiry.

**CHM 371:** This course consists of four compulsory laboratory exercises that explore a breadth of topics in chemistry. The compulsories include inorganic synthesis, physical characterization, spectroscopy, and computational chemistry. Incorporated into these experiments are analytical methods, quantitative methods, and instrumental methods. Proper lab technique and data management are also part of the learning experience.

**CHM 373:** This course introduces fundamental principles of modern analytical methods such as spectroscopy, chromatography, and electrochemistry. Students learn about instrumental methods that employ these concepts and how to interpret data collected using these techniques. Discussion includes statistical treatment of data using standard methods for proper reporting of information with precision, accuracy, and uncertainty.

N.B. CHM 371 is a core course and CHM 373 counts as a cognate course.
Inorganic Chemistry

The Department of Chemistry recently revamped our Inorganic chemistry undergraduate course offerings. The Inorganic chemistry offerings are CHM 411 (F) and CHM 412 (S). The first six weeks of both CHM 411 and 412 will cover the same foundational topics in coordination chemistry structure and bonding. The two courses will diverge during the second six-week period. Thus, students will select whether to take 411 or 412 based on scheduling (i.e., they are offered in different terms) and topical interest.

**CHM 411: Inorganic Chemistry: Structure and Reactivity (Fall),** will consider topics of molecular reactivity and reaction mechanism after developing key concepts in bonding and coordination chemistry structure.

**CHM 412: Inorganic Chemistry: Structure and Materials (Spring),** will consider topics in the areas of solid-state chemistry, inorganic materials chemistry, and nanoscience after completing the initial 6-week development of coordination chemistry bonding and structure.

Either CHM 411 or 412 will prepare the student for advanced Inorganic Chemistry coursework at the 500-level.

Independent Work

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<th>Fall</th>
<th>Spring</th>
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<tr>
<td>Junior Year</td>
<td>CHM 981 Fall:</td>
<td>CHM 981 Spring:</td>
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<td>✦ Colloquia - Monday evenings</td>
<td>✦ Laboratory Work</td>
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<td>Two Professors present their research. Attendance is mandatory.</td>
<td>Original research project. At the end of the semester, you will submit a research proposal summarizing your results, and outlining future work.</td>
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<td>✦ Reading Groups - Write critical analysis of a research article.</td>
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<tr>
<td>Senior Year</td>
<td><strong>Thesis work</strong></td>
<td>Thesis work completed, and written thesis submitted.</td>
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<td>✦ All thesis projects are experimental.</td>
<td>✦ Due date is usually mid-April.</td>
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<td>No “library theses” are accepted.</td>
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Certificates

✦ Some of the more common certificates that chemistry majors have earned through Princeton University are: Environmental Studies, Material Science and Engineering, Neuroscience, Quantitative and Computational Biology, and Sustainable Energy.

Professional Certification and Graduate School Preparation

✦ Students also have the opportunity to attain a chemistry degree that is certified by the American Chemical Society (ACS). The ACS guidelines list courses that are strongly recommended to be completed as thorough preparation for entering Graduate School.

Requirements for ACS Certification:

- Two semesters organic chemistry (CHM 301 and CHM 302/304)
- Two semesters physical chemistry (CHM 305 and CHM 306/406)
- One semester inorganic chemistry (CHM 411 or CHM 412)
- One semester biochemistry (MOL 345 or CHM 403)
- One semester experimental chemistry (CHM 371)
- Two additional courses in the chemistry department, or cross-listed with the chemistry department, taken for subject depth
- Two semesters Junior Independent Work (CHM 981)
- Two semesters Senior Independent Work (CHM 984)