CHEMISTRY, PH.D.

Saint Louis University's Department of Chemistry offers a doctoral program where students must complete intensive research culminating in a dissertation. The Ph.D. offers specializations, including traditional areas of analytical, physical, organic and inorganic chemistry, as well as cross-disciplinary areas of materials and biological chemistry.

Graduate students in the chemistry department have access to a number of research tools, including:

- Bruker 400 and 700 MHz NMR spectrometers
- Bruker-EMX EPR, UV-Vis and FTIR spectrometers
- Research-grade spectrofluorometers
- GC-MS and LC-MS
- Electrochemical analyzers
- Gas chromatographs
- A scanning electron micrograph
- Computational facilities with modern molecular software
- A Bruker CCD X-ray diffractometer facility

The chemistry program offers students:

- Close mentoring relationships.
- Small research group size.
- Opportunities to participate in interdisciplinary research.

Curriculum Overview

The Ph.D. in Chemistry requires a minimum of 30 post-baccalaureate credits, with at least 24 credits of coursework and 12 credits of dissertation research.

Fieldwork and Research Opportunities

Ph.D. students must complete intense research culminating in a dissertation.

Our graduate students are active in the research areas of analytical, organic, physical, synthetic, materials, environmental and biological chemistry. Our research groups regularly publish in top-ranked journals and present at national and international conferences.

Research is externally supported by the U.S. Air Force Office of Scientific Research, National Institutes of Health, National Science Foundation, Petroleum Research Fund and the American Heart Association, among others.

Careers

Doctoral graduates pursue different paths, including teaching, postdoctoral studies, or careers in industry or with government agencies, such as the FDA.

Past students have gone on to careers as research scientists, teachers, university faculty, and in various capacities in pharmaceutical companies and government agencies.

Admission Requirements

Applicants should possess sufficient GPA and TOEFL (if applicable) scores, and a bachelor's degree from an accredited college or university, usually in chemistry or biochemistry, although other science majors will be considered.

Admission normally requires a minimum of 18 semester credits (minimum 2.8 GPA) of upper-division undergraduate chemistry courses including: organic chemistry (two semesters), quantitative analysis (one semester) and physical chemistry (two semesters). Students who do not meet these criteria may complete these prerequisites as part of their graduate program, though not for graduate credit.

Students who have not completed equivalent coursework in upper-level undergraduate "Inorganic Chemistry" and "Instrumental Analysis" will also be required to complete these courses but they can be taken for departmental graduate credit.

Application Requirements

- Application form and fee
- Three letters of recommendation
- Résumé
- Goal statement
- Interview (desired)

Requirements for International Students

All admission policies and requirements for domestic students apply to international students along with the following:

- Demonstrate English Language Proficiency (http://catalog.slu.edu/academic-policies/office-admission/graduate/english-language-proficiency)
- Proof of financial support must include:
  - A letter of financial support from the person(s) or sponsoring agency funding the time at Saint Louis University
  - A letter from the sponsor's bank verifying that the funds are available and will be so for the duration of study at the University
- Academic records, in English translation, of students who have undertaken postsecondary studies outside the United States must include the courses taken and/or lectures attended, practical laboratory work, the maximum and minimum grades attainable, the grades earned or the results of all end-of-term examinations, and any honors or degrees received. WES and ECE transcripts are accepted.

Application Deadlines

Students who want to be considered for the summer and fall semesters must submit their application by Jan. 15. Students who want to be considered for the spring semester should apply by Oct. 1.

Review Process

A three-person committee votes whether to accept applicants.

Scholarships, Assistantships and Financial Aid

For priority consideration for graduate assistantship, applicants should complete their applications by the program admission deadlines listed. Fellowships and assistantships provide a stipend and may include health insurance and a tuition scholarship for the duration of the award.

For more information, visit the student financial services office online at http://www.slu.edu/financial-aid.
Learning Outcomes

1. Graduates will be able to demonstrate advanced level knowledge in both
   a. synthesis and materials chemistry and
   b. analytical and physical chemistry methods, with a higher level of
      knowledge expected in the student’s area of research.
2. Graduates will be able to use standard search tools and retrieval
   methods to obtain information about a topic, substance, technique, or
   an issue relating to chemistry and assess relevant studies from the
   chemical literature.
3. Graduates will be able to communicate scientific findings from
   literature and original findings from the student’s own independent
   research in written publications and oral presentations.
4. Graduates will be able to acquire the basic tools, including chemical
   practices and theories, needed to conduct advanced chemical
   research. Students will become proficient in their specialized area of
   chemistry and complete an advanced, independent research project
   resulting in peer-reviewed publications.
5. Graduates will be able to adhere to accepted ethical and professional
   standards in chemistry.

Requirements

Select two of the following:

- Analytical and Physical Methods Courses
- Synthesis and Materials Chemistry Courses

CHEM 5160 Advanced Synthetic Chemistry
CHEM 5400 Organic Spectroscopy
CHEM 5440 Bioorganic Chemistry
CHEM 5450 Advanced Organic Chemistry
CHEM 5460 Synthetic Organic Chemistry
CHEM 5470 Principles of Medicinal Chemistry
CHEM 5500 Inorganic Chemistry
CHEM 5550 Organometallic Chemistry
CHEM 5560 Solid State Chemistry
CHEM 5590 Special Topics: Inorganic Chemistry
CHEM 5800 Fundamentals and Design of Nanomaterials
CHEM 5850 Polymer Chemistry

Select two of the following:

- CHEM 5150 Statistical Methods of Physical Scientists
- CHEM 5170 Advances in Analysis and Modeling of Chemical Systems
- CHEM 5200 Analytical Chemistry II
- CHEM 5230 Mass Spectrometry
- CHEM 5250 Bioanalytical Meth Analysis
- CHEM 5260 Analytical Separations
- CHEM 5270 Electroanalytical Chemistry
- CHEM 5290 Special Topics
- CHEM 5330 Advanced Physical Chemistry
- CHEM 5340 Advanced Thermodynamics
- CHEM 5350 Elements of Surface/Colloid Science
- CHEM 5370 Computational Chemistry
- CHEM 5390 Special Topics: Physical Chemistry
- CHEM 5450 Advanced Organic Chemistry

CHEM 5570 Group Theory & Spectroscopy
CHEM 5620 Biophysical Chemistry
CHEM 5630 Introduction to Chemical Biology and Biotechnology
CHEM 5700 Environmental Chemistry
CHEM 5800 Fundamentals and Design of Nanomaterials

Required Research Courses

<table>
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<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHEM 5970</td>
<td>Research Topics</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 6900</td>
<td>Introduction to Proposal Writing and Oral Presentations</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 6990</td>
<td>Dissertation Research (taken over multiple semesters)</td>
<td>12</td>
</tr>
</tbody>
</table>

Research Elective Courses

Select one of the following: 3

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>CHEM 5299</td>
<td>Introduction to Analytical Research</td>
</tr>
<tr>
<td>CHEM 5399</td>
<td>Introduction to Physical Research</td>
</tr>
<tr>
<td>CHEM 5499</td>
<td>Introduction to Organic Research</td>
</tr>
<tr>
<td>CHEM 5599</td>
<td>Introduction to Inorganic Research</td>
</tr>
</tbody>
</table>

Chemistry Elective

Chemistry courses listed above for synthesis and materials chemistry or analytical and physical methods. Electives can also be fulfilled by taking 5000-level courses in other disciplines such as biology, math, computer science, engineering, and pharmacology with approval by Graduate Program Coordinator and student’s committee.

Total Credits: 39

Non-Course Requirements

- Completion of Research Progress Exam
- Completion of Written Comprehensive Exam
- Completion of Oral Defense of Research Proposal

New Ph.D. degree students who enter the program with a B.S. or B.A. degree may take the written preliminary exam the first or second spring semester they are in the program. New Ph.D. students who enter the program with a Master’s degree are required to take the written preliminary exam the first spring semester they are at SLU.

Continuation Standards

Students must maintain a cumulative grade point average (GPA) of 3.00 in all graduate/professional courses.

Roadmap

Roadmaps are recommended semester-by-semester plans of study for programs and assume full-time enrollment unless otherwise noted.

Courses and milestones designated as critical (marked with !) must be completed in the semester listed to ensure a timely graduation. Transfer credit may change the roadmap.

This roadmap should not be used in the place of regular academic advising appointments. All students are encouraged to meet with their advisor/mentor each semester. Requirements, course availability and sequencing are subject to change.

<table>
<thead>
<tr>
<th>Course</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Year One</td>
<td></td>
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</tr>
<tr>
<td>Fall</td>
<td>Synthesis &amp; Materials Chemistry course (p. 3)</td>
<td>3</td>
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</tbody>
</table>
Analytical & Physical Methods course (p. 3) 3
CHEM 5X99 Introduction to Research 3
Credits 9

Spring
Synthesis & Materials Chemistry course (p. 3) 3
Analytical & Physical Methods course (p. 3) 3
Credits 6

Summer
CHEM 5970 Research Topics 3
Credits 3

Year Two
Fall
Chemistry electives (p. 4) 3-6
Credits 3-6

Spring
Completion of Research Progress Exam
Chemistry electives (p. 4) 3-0
Credits 3-0

Summer
CHEM 6990 Dissertation Research (See information in Program Notes) † 3
Credits 3

Year Three
Fall
Completion of Written Comprehensive Exam
CHEM 6900 Introduction to Proposal Writing and Oral Presentations 3
CHEM 6990 Dissertation Research † 1
Credits 4

Spring
CHEM 6990 Dissertation Research † 2
Credits 2

Summer
CHEM 6990 Dissertation Research † 1
Credits 1

Year Four
Fall
CHEM 6990 Dissertation Research † 1
Credits 1

Spring
CHEM 6990 Dissertation Research † 1
Credits 1

Summer
CHEM 6990 Dissertation Research † 1
Credits 1

Year Five
Fall
CHEM 6990 Dissertation Research † 1
Credits 1

Spring
CHEM 6990 Dissertation Research † 1
Credits 1

Total Credits 39

† Students are required to complete a minimum of 12 credits of Dissertation Research. The number of credits can vary each semester, but a student cannot register for zero credits of research until the 12 credits have been completed.

Program Notes

Synthesis and Materials Chemistry Courses
Must take two courses.

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>CHEM 5160</td>
<td>Advanced Synthetic Chemistry</td>
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</tr>
<tr>
<td>CHEM 5400</td>
<td>Organic Spectroscopy</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 5440</td>
<td>Bioorganic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 5450</td>
<td>Advanced Organic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 5460</td>
<td>Synthetic Organic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 5470</td>
<td>Principles of Medicinal Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 5500</td>
<td>Inorganic Chemistry (with a total of 3)</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 5550</td>
<td>Organometallic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 5560</td>
<td>Solid State Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 5590</td>
<td>Special Topics: Inorganic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 5800</td>
<td>Fundamentals and Design of Nanomaterials</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 5850</td>
<td>Polymer Chemistry</td>
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</table>

Total Credits 36

Analytical and Physical Methods Courses
Must take two courses.

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<tr>
<td>CHEM 5150</td>
<td>Statistical Methods of Physical Scientists</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 5170</td>
<td>Advances in Analysis and Modeling of Chemical Systems</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 5200</td>
<td>Analytical Chemistry II (with a total of 3)</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 5230</td>
<td>Mass Spectroscopy</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 5250</td>
<td>Bioanalytical Meth Analysis</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 5260</td>
<td>Analytical Separations</td>
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<td>CHEM 5270</td>
<td>Electroanalytical Chemistry</td>
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<td>CHEM 5290</td>
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<td>CHEM 5330</td>
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<td>Fundamentals and Design of Nanomaterials</td>
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</tr>
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Must take at least two courses.

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