

# CHEMISTRY, PH.D.

Saint Louis University's Department of Chemistry offers a doctoral program where students must complete intensive research culminating in a dissertation. SLU's chemistry Ph.D. program 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 SLU's 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

SLU's Ph.D. in Chemistry requires a minimum of 39 post-baccalaureate credits, with at least 24 credits of coursework and 12 credits of dissertation research.

## Fieldwork and Research Opportunities

Chemistry Ph.D. students at SLU 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 from SLU's chemistry Ph.D. program 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

- Graduates will be able to demonstrate advanced level knowledge in both
  - synthesis and materials chemistry and
  - analytical and physical chemistry methods, with a higher level of knowledge expected in the student's area of research.
- 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.
- 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.
- 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.
- Graduates will be able to adhere to accepted ethical and professional standards in chemistry.

## Requirements

Code	Title	Credits
<b>Synthesis and Materials Chemistry Courses</b>		
Select two of the following:		6
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 <sup>1</sup>	
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	
<b>Analytical and Physical Methods Courses</b>		
Select two of the following:		6
CHEM 5150	Statistical Methods of Physical Scientists	
CHEM 5170	Advances in Analysis and Modeling of Chemical Systems	
CHEM 5200	Analytical Chemistry II <sup>1</sup>	
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	
<b>Required Research Courses</b>		
CHEM 5970	Research Topics	3
CHEM 6900	Introduction to Proposal Writing and Oral Presentations	3
CHEM 6990	Dissertation Research (taken over multiple semesters)	12
<b>Research Elective Courses</b>		
Select one of the following:		3
CHEM 5299	Introduction to Analytical Research	
CHEM 5399	Introduction to Physical Research	
CHEM 5499	Introduction to Organic Research	
CHEM 5599	Introduction to Inorganic Research	
<b>Chemistry Elective</b>		
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.		6
Total Credits		39

## Non-Course Requirements

- Completion of Research Progress Exam
- Completion of Written Comprehensive Exam
- Completion of Oral Defense of Research Proposal
- A public oral presentation and a private oral examination

## 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.

Course	Title	Credits
<b>Year One</b>		
<b>Fall</b>		
Synthesis & Materials Chemistry course (p. 3)		3
Analytical & Physical Methods course (p. 3)		3
CHEM 5X99	Introduction to Research	3
Credits		9

<b>Spring</b>			
Synthesis & Materials Chemistry course (p. 3)		3	
Analytical & Physical Methods course (p. 3)		3	
	Credits		6
<b>Summer</b>			
CHEM 5970	Research Topics	3	
	Credits		3
<b>Year Two</b>			
<b>Fall</b>			
Chemistry electives (p. 3)		3-6	
	Credits		3-6
<b>Spring</b>			
Completion of Research Progress Exam			
Chemistry electives (p. 3)		3-0	
	Credits		3-0
<b>Summer</b>			
CHEM 6990	Dissertation Research (See information in Program Notes) <sup>†</sup>	3	
	Credits		3
<b>Year Three</b>			
<b>Fall</b>			
Completion of Written Comprehensive Exam			
CHEM 6900	Introduction to Proposal Writing and Oral Presentations	3	
CHEM 6990	Dissertation Research <sup>†</sup>	1	
	Credits		4
<b>Spring</b>			
CHEM 6990	Dissertation Research <sup>†</sup>	2	
	Credits		2
<b>Summer</b>			
CHEM 6990	Dissertation Research <sup>†</sup>	1	
	Credits		1
<b>Year Four</b>			
<b>Fall</b>			
CHEM 6990	Dissertation Research <sup>†</sup>	1	
	Credits		1
<b>Spring</b>			
CHEM 6990	Dissertation Research <sup>†</sup>	1	
	Credits		1
<b>Summer</b>			
CHEM 6990	Dissertation Research <sup>†</sup>	1	
	Credits		1
<b>Year Five</b>			
<b>Fall</b>			
CHEM 6990	Dissertation Research <sup>†</sup>	1	
	Credits		1
<b>Spring</b>			
CHEM 6990	Dissertation Research <sup>†</sup>	1	
	Credits		1
	Total Credits		39

<sup>†</sup> 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.

Code	Title	Credits
CHEM 5160	Advanced Synthetic Chemistry	3
CHEM 5400	Organic Spectroscopy	3
CHEM 5440	Bioorganic Chemistry	3
CHEM 5450	Advanced Organic Chemistry	3
CHEM 5460	Synthetic Organic Chemistry	3
CHEM 5470	Principles of Medicinal Chemistry	3
CHEM 5500	Inorganic Chemistry <sup>1</sup>	3
CHEM 5550	Organometallic Chemistry	3
CHEM 5560	Solid State Chemistry	3
CHEM 5590	Special Topics: Inorganic Chemistry	3
CHEM 5800	Fundamentals and Design of Nanomaterials	3
CHEM 5850	Polymer Chemistry	3

### Analytical and Physical Methods Courses

Must take two courses.

Code	Title	Credits
CHEM 5150	Statistical Methods of Physical Scientists	3
CHEM 5170	Advances in Analysis and Modeling of Chemical Systems	3
CHEM 5200	Analytical Chemistry II <sup>1</sup>	3
CHEM 5230	Mass Spectrometry	3
CHEM 5250	Bioanalytical Meth Analysis	3
CHEM 5260	Analytical Separations	3
CHEM 5270	Electroanalytical Chemistry	3
CHEM 5290	Special Topics	3
CHEM 5330	Advanced Physical Chemistry	3
CHEM 5340	Advanced Thermodynamics	3
CHEM 5350	Elements of Surface/Colloid Science	3
CHEM 5370	Computational Chemistry	3
CHEM 5390	Special Topics: Physical Chemistry	3
CHEM 5450	Advanced Organic Chemistry	3
CHEM 5570	Group Theory & Spectroscopy	3
CHEM 5620	Biophysical Chemistry	3
CHEM 5630	Introduction to Chemical Biology and Biotechnology	3
CHEM 5700	Environmental Chemistry	3
CHEM 5800	Fundamentals and Design of Nanomaterials	3

### Chemistry Electives

Must take at least two courses.

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.