

Chemistry

Degrees Offered

- Master of Science
- Doctor of Philosophy

Nature of the Program

The Department of Chemistry offers graduate studies leading to the degrees of master of science and doctor of philosophy with research concentration in the areas of analytical, inorganic, organic, and physical chemistry. The master of science and doctor of philosophy degrees require completion of a research project which represents the principal component of the graduate program. The M.S. program is limited in scope and involves advanced coursework and a study of a problem in chemical research culminating in the preparation and oral defense of a M.S. thesis.

The Ph.D. program has a much wider scope than the M.S. program. Ph.D. students are expected to take a broad range of advanced coursework, both within and outside of the major area of interest. The major emphasis of the Ph.D. program is on research. A typical research problem may take several years to complete and involves many advanced techniques and concepts at the frontiers of chemical knowledge. The Ph.D. program culminates in the preparation and defense of the Ph.D. dissertation.

The program for the degree of doctor of philosophy reflects a flexible, research-oriented approach geared to develop the interests, capability, and potential of students. A program of courses is recommended to suit individual needs based on background and ability. These courses are classified as basic graduate courses, which present the essentials of a given discipline on an advanced level, and specialized graduate courses, which take one to the frontiers in a specific area of research. The course offerings are designed to provide guidelines from which students can launch their independent studies in preparation for candidacy examinations. Students are required to enroll in the departmental seminar program and attend special lectures and seminars offered by visiting scientists. Graduate students in the Ph.D. program are required to satisfactorily complete a minimum of three courses (three credits each) at the 500 to 700-level offered by the Department of Chemistry and distributed in at least two areas outside their major area of research. In addition, each major area in chemistry requires students in that area to enroll in basic graduate courses presenting the essentials of that discipline on an advanced level.

FACULTY

CHAIR

- Gregory Dudley - Ph.D. (Massachusetts Institute of Technology)

ASSOCIATE CHAIR

- Michelle Richards-Babb - Ph.D. (Lehigh University)

DIRECTOR OF GRADUATE STUDIES

- Brian Popp - Ph.D. (University of Wisconsin-Madison)

DIRECTOR OF UNDERGRADUATE STUDIES

- Betsy Ratcliff - Ph.D. (University of Binghamton-SUNY)

PROFESSORS

- Gregory Dudley - Ph.D. (Massachusetts Institute of Technology)
Regular Graduate Faculty; Eberly Family Distinguished Professor; Chemical Synthesis, Organic Reaction Methodology, Medicinal Chemistry
- Terry Gullion - Ph.D. (William and Mary)
Regular Graduate Faculty; Physical Chemistry, Solid State NMR, Biological Materials, Polymers
- Lisa Holland - Ph.D. (University of North Carolina-Chapel Hill)
Regular Graduate Faculty; Micro-separations, High Throughput Drug Screening
- Fred L. King - Ph.D. (University of Virginia)
Regular Graduate Faculty; Analytical Chemistry, Mass Spectrometry, Trace Elements, Gas-phase Chemistry
- Justin Legleiter - Ph.D. (Carnegie Mellon University)
Regular Graduate Faculty; Biophysical Chemistry, Scanning Probe Microscopy
- Michelle Richards-Babb - Ph.D. (Lehigh University)
Regular Graduate Faculty; Chemical Education
- Kenneth Showalter - Ph.D. (University of Colorado)
Regular Graduate Faculty; Bennett Distinguished Professor; Physical Chemistry, Chemical Kinetics, Multistability and Oscillating Systems

- Bjorn C. Soderberg - Ph.D. (Royal Institute of Technology, Sweden)
Regular Graduate Faculty; Organic Synthesis Using Transition Metals

ASSOCIATE PROFESSORS

- Erin Battin - Ph.D. (Clemson University)
Bioinorganic Chemistry
- Fabien Goulay - Ph.D. (Université of Rennes, France)
Regular Graduate Faculty; Physical Chemistry, Laser Spectroscopy
- Jessica Hoover - Ph.D. (University of Washington)
Regular Graduate Faculty; Organometallic Chemistry, Catalysis
- Peng Li - Ph.D. (Texas Tech University)
Regular Graduate Faculty; Bioanalytical Chemistry
- Carsten Milsmann - Ph.D. (Max Planck Institute for Bioinorganic Chemistry)
Regular Graduate Faculty; Inorganic and Organic Chemistry, Photochemistry, Catalysis
- Brian Popp - Ph.D. (University of Wisconsin-Madison)
Regular Graduate Faculty; Organic and Organometallic Chemistry, Catalysis
- Joshua Osbourn - Ph.D. (University of Pittsburgh)
Organic Chemistry
- Betsy Ratcliff - Ph.D. (University of Binghamton-SUNY)
Chemical Education, Physical Chemistry
- Mark Tinsley - Ph.D. (Leeds University, England)
Physical Chemistry, Nonlinear Dynamics
- Stephen Valentine - Ph.D. (Indiana University)
Regular Graduate Faculty; Mass Spectrometric Analysis of Biomolecules
- Mingming Xu - Ph.D. (Ohio University)
Analytical Chemistry

ASSISTANT PROFESSORS

- Hacer Karatas Bristow - Ph.D. (University of Michigan)
Regular Graduate Faculty; Chemical Biology, Bioorganic and Medicinal Chemistry
- Brian Dolinar - Ph.D. (University of Wisconsin-Madison)
Inorganic Chemistry
- Melissa Ely - Ph.D. (West Virginia University)
Analytical Chemistry
- Margaret Hilton - Ph.D. (University of Utah)
Regular Graduate Faculty; Organic and Organometallic Chemistry, Catalysis
- Carolyn Kitchens - Ph.D. (University of Pittsburgh)
Biochemistry
- David Mersing - Ph.D. (West Virginia University)
Teaching Faculty; Physical Chemistry
- Brian Nichols - Ph.D. (West Virginia University)
Organic Chemistry
- Tobi Odeleye - Ph.D. (South Dakota State University)
Regular Graduate Faculty; Chemical Education
- Trina Perrone - Ph.D. (West Virginia University)
Organic Chemistry

TEACHING INSTRUCTOR

- Mark Schraf - M.S. (West Virginia University)
Analytical Chemistry

PROFESSORS EMERITI

- Harry Finklea - Ph.D. (California Institute of Technology)
- Charles Jaffe - Ph.D. (University of Colorado)
- Robert Nakon - Ph.D. (Texas A&M University)
- Jeffrey Petersen - Ph.D. (University of Wisconsin-Madison)

- Ronald Smart - Ph.D. (University of Michigan)
- Kung Wang - Ph.D. (Purdue University)

Admissions

PH.D. IN CHEMISTRY

The Chemistry program admits students directly to the doctoral degree. Admitted students may transition to the M.S. in Chemistry during their studies. In addition to the university's general admission requirements (<http://catalog.wvu.edu/graduate/graduateeducationatwestvirginiauniversity/#classificationtext>), applicants to the Ph.D. program must hold a bachelor's degree in chemistry or a related field with a concentration in chemistry and an appropriate background in physics and mathematics, with an overall GPA of at least 3.0. The GRE is not required for admission to this program.

List of Admission Requirements:

- See the steps to apply for admissions and access the application here (<https://graduateadmissions.wvu.edu/how-to-apply/>).
- A personal statement discussing specific examples of the applicant's ability to write effectively, analyze complex situations, and complete quantitative analyses. The following topics should also be included in the statement: 1) why a career in chemistry, 2) how will a PhD in Chemistry help the applicant reach their professional goals, 3) why WVU Chemistry offers the best opportunity for achieving those future professional goals, and 4) which faculty member(s) and/or research area(s) the applicant wishes to pursue in the WVU Chemistry PhD program. Information about the Chemistry faculty and their research interests can be found here (<https://www.chemistry.wvu.edu/directory/>).
- A current curriculum vitae or resume that lists work experience, volunteer activities, internships, academic degrees and honors, and other accomplishments the applicant considers relevant.
- Three letters of recommendation from professional or academic references who can comment directly on the applicant's skills and experience.

International Applicants:

- See the steps to apply for admissions and access the application here (<https://graduateadmissions.wvu.edu/how-to-apply/>).
- International applicants should view additional requirements here (<http://catalog.wvu.edu/graduate/graduateeducationatwestvirginiauniversity/#internationaltext>) and here (<https://graduateadmissions.wvu.edu/information-for/international-students/>).
- English language proficiency is required in order to hold a graduate teaching assistantship. See here (<https://elli.wvu.edu/testing-resources/english-proficiency-gtas/>).

Application Deadline:

- The priority review deadline for all application materials for fall admission is January 1st.
- Applicants are typically notified of the committee's decision on or before February 1st.
- Completed applications for admission may be considered after the January 1st deadline on a space-available basis.
- The Chemistry program admits students for the Fall semester only.
- Exceptional applicants may be nominated by the Chemistry program for competitive University Fellowships. Qualified applicants will be notified if they are nominated. More information on WVU fellowships can be found here (<https://graduateeducation.wvu.edu/finances/fellowships/>).
- At this time, the Chemistry program is not accepting applications to the MS program.

For further information, please contact: Director of Graduate Studies, Chemistry.DGS@mail.wvu.edu.

Assistantships

All applicants will be considered for financial support in the form of graduate teaching assistantships (GTAs) and graduate research assistantships (GRAs). Graduate research assistantships are sometimes available through funded faculty member research. Students who qualify for available research assistantships will be made aware of these opportunities during the Chemistry New Graduate Student Orientation held prior to the beginning of the Fall term.

Certain application requirements may be waived based on a preliminary review of an application by the program.

ADMISSION REQUIREMENTS 2024-2025

The Admission Requirements above will be the same for the 2024-2025 Academic Year.

Major Code: 1439

For specific information on the following program, please see the link to the right:

- Chemistry, M.S.

For specific information on the following program, please see the link to the right:

- Chemistry, Ph.D.

Degree Progress

GENERAL BENCHMARKS

Guidance Exams

By the end of the second semester in residence, both M.S. and Ph.D. students are required to pass 3 out of 4 guidance exams. The guidance exams are in the areas of analytical, inorganic, organic, and physical chemistry. Students have 3 total attempts to pass each exam. The initial attempts occur prior to the student's first semester in the form of written exams generally during orientation week. Subsequent attempts can be either re-taking the written exam or earning a grade of B- or better in a designated graduate course. Failure to meet the guidance exam requirement by the end of the second semester in residence will result in termination from the graduate program.

Plan of Study

By the end of the first semester in residence, M.S. and Ph.D. students are required to have a Plan of Study, documenting expected coursework that is approved by both the student's faculty M.S. thesis/Ph.D. dissertation Faculty Research Advisor and the Chemistry Director of Graduate Studies. By the end of the second semester in residence, M.S. and Ph.D. students are required to update their Plan of Study, documenting their M.S. thesis/Ph.D. dissertation committee members. M.S. students who choose the coursework track are advised by the Chemistry Graduate Studies committee who will oversee appropriate updates to the Plan of Study. To remain in good standing, it is the responsibility of the graduate student to keep their Plan of Study updated while in residence. Failure to meet Plan of Study submission or update deadlines will place the student out of program compliance, leading to poor standing and probationary status that may impact a student's ability to maintain their assistantship or fellowship.

Coursework

Students must maintain a minimum 2.75 cumulative GPA to remain eligible for a graduate assistantship. Failure to do so may result in loss of the graduate assistantship until the minimum cumulative GPA is reestablished.

Program Status

A graduate student is expected to remain in good standing throughout the entirety of the program. Standing in the program is based in part on student research progress, which will be evaluated semestery through the awarding of a satisfactory (S) or unsatisfactory (U) grade in CHEM 797, and yearly through written evaluation by the faculty research advisor. A student may also will be considered in poor standing if satisfactory research progress is not maintained while in residence. Poor standing will result if a grade of unsatisfactory (U) is earned in research (CHEM 797) and/or conveyed through written evaluation by the Faculty Research Advisor. A student may be considered in poor standing for failure to maintain ethical and safe laboratory practices in their daily academic, research, and/or teaching duties. A student in poor standing will be placed on probationary status and clear expectations will be communicated that, if met, will return the student to good standing. Failure to meet documented expectations will result in termination from the graduate program.

PH.D. BENCHMARKS

Research

Research may be initiated as early as the student and Faculty Research Advisor feel appropriate for the individual. Normally, a student will begin laboratory work no later than the beginning of the second semester in residence. Upon successful completion of an original piece of research, the candidate will present results in a Ph.D. dissertation and, at the appropriate time, defend the work in a final oral examination. Failure to maintain satisfactory research progress after two successive semesters will result in the student being transitioned to either the M.S. thesis or coursework track after advisement by the Faculty Research Advisor and the Graduate Studies Committee.

Seminars

All students pursuing a PhD must register for both graduate seminar (CHEM 796) and research seminar (CHEM 789) every semester in residence. Students who have a justified reason for being unavailable for a seminar, during a specific semester, must petition the Chemistry Graduate Studies Committee in writing before the semester begins to receive a waiver of the requirement. A student may be considered in poor standing for repeated failures to register for appropriate seminars.

Candidacy

Candidacy examinations contain written and oral portions. Generally, students will attain candidacy before beginning their 3rd year (5th semester) in the doctoral program. The Graduate Studies Committee will consider Research Faculty Advisor approved extension requests for justified reasons. Such requests should be made by email to the Director of Graduate Studies at least two-weeks prior to the deadlines outlined below.

- The written portion is a research progress report that will contain a comprehensive review of the pertinent literature and applicable scientific concepts, a discussion of current results, a description of studies needed to finish the project, a discussion of expected results and alternative approaches, and a timeline for completing the work. The report is submitted to the student's Graduate Research Committee by the end of final's week of their third (3rd) semester in residence. The Graduate Research Committee may request revisions to the written document, with final revisions completed no later than mid-term of the fourth (4th) semester in residence. The Graduate Research Committee will grade the final document as pass/fail.
- After notification of successful completion of the written portion, the student will publicly present and defend an oral progress report by the end of final's week of their fourth (4th) semester in residence. This oral report must demonstrate fundamental chemical knowledge and independence

on the part of the student. The Graduate Research Committee will evaluate the oral portion as pass/fail or conditional reconsideration. A student who receives conditional reconsideration will have documented conditions and timeline for improvement provided by their Graduate Research Committee. The timeline for completion of the conditions will typically be no longer than the end of the subsequent semester. The Graduate Research Committee will reevaluate all aspects of the oral portion as pass/fail only.

Failure to pass either written or oral candidacy examinations will result in the student being transitioned to either the M.S. thesis or coursework track after advisement by the Faculty Research Advisor and the Graduate Studies Committee.

Research Progress Updates

All doctoral students will complete a survey in every year in residence, assessing their own progress in the program and documenting research products. The survey results will be shared with their Faculty Research Advisor.

Doctoral candidates will meet with their Chemistry Graduate Research Committee members at least once a year after attaining candidacy status. Generally, students will schedule these committee meetings in late spring or summer term at the end of their 3rd and 4th years (after six and eight semesters in residence) and subsequent years, if necessary. The candidate will prepare a short 10-minute oral presentation to update their committee members on notable successes and research products from the previous year. Included in the presentation is discussion of plans to complete their dissertation requirements. The committee members will evaluate the student's work as satisfactory or unsatisfactory progress toward their degree. A student whose progress is unsatisfactory will be issued a remediation plan, established by the Graduate Research Committee members, and moved to probationary status for the subsequent academic term. Failure to meet remediation plan guidelines will result in the student being transitioned to either the M.S. thesis or coursework track after advisement by the Faculty Research Advisor and the Graduate Studies Committee.

Original Research Proposal

Doctoral candidates will prepare and present a written and oral independent original research proposal. The written proposal proposes a unique research idea that is outside of the candidate's doctoral research. The written proposal will be distributed to all members of the department including faculty and graduate students. An oral defense of the proposed idea will occur within the divisional seminar programs. After the presentation all members in attendance will have an opportunity to pose questions to the presenter. All faculty in attendance at the seminar will evaluate the proposal, both written and oral, on established criteria. Candidates must pass this requirement before they will be allowed to schedule their oral dissertation defense. Failure to pass the original research proposal will result in the student being transitioned to either the M.S. thesis or coursework track after advisement by the Faculty Research Advisor and the Graduate Studies Committee.

M.S. BENCHMARKS

Coursework: Students must earn a minimum cumulative GPA of 2.75 in order to graduate and must earn a B- or better in all coursework applied to the M.S. degree requirements.

Seminars: All students in the thesis track must register for both graduate seminar (CHEM 796) and research seminar (CHEM 789) every semester. Students in the coursework track may register in a graduate seminar and must register for research seminar every semester. Students who have a justified reason for being unavailable for a seminar, during a specific semester, must petition the Chemistry Graduate Studies Committee in writing before the semester begins to receive a waiver of the requirement. A student may be considered in poor standing for repeated failures to register for appropriate seminars.

Thesis Track

Research may be initiated as early as the student and Faculty Research Advisor feel appropriate for the individual. Normally, a student will begin laboratory work no later than the beginning of the second semester in residence. Upon successful completion of an original piece of research, the candidate will present results in a M.S. thesis and, at the appropriate time, defend the work in a final oral examination. Failure to maintain satisfactory research progress will result in the student being transitioned to the M.S. coursework track.

Graduate students in the M.S. program in chemistry in the thesis track are required to submit a research thesis. A research project is chosen in the area of the student's interest and in consultation with the faculty thesis advisor. The written thesis and oral defense shows the ability of the student to defend scientific conclusions based on their research project. The final oral examination is administered after completion and submission of the thesis to the graduate student's committee.

- **Credit Hour Requirement:** Students may apply up to 6 hours of research credit and 3 hours of seminars toward the 30-hour requirement. The remaining 21 hours of credit must be earned in basic graduate courses (500-level or higher) that reflect a diversified exposure to chemistry, and no more than 10 hours may be elected outside the department. Students are required to enroll in the departmental seminar program and are required to attend special lectures and seminars offered by visiting scientists.

Coursework Track

Graduate students in the M.S. program in chemistry in the coursework track are *not* required to submit a research thesis. The student may choose to perform research for research credit.

- **Credit Hour Requirement:** Students may apply up to 3 hours of research credit and 3 hours of seminars toward the 30-hour requirement. The remaining 24 hours of credit must be earned in basic graduate courses (500-level or higher) that reflect a diversified exposure to chemistry, and no

more than 10 hours may be elected outside the department. Students are required to enroll in the departmental seminar program and are required to attend special lectures and seminars offered by visiting scientists.