CHEMISTRY

http://www.uvm.edu/~chem/

OVERVIEW

The Chemistry Department currently offers graduate programs leading to either the M.S. or Ph.D. in analytical, biological, inorganic, organic, or physical chemistry. In recent years about eight students per year have received the Ph.D. In the Chemistry Department, courses are offered in inorganic chemistry, organometallic chemistry, physical inorganic chemistry, synthetic organic chemistry, physical organic chemistry, heterocyclic chemistry, advanced analytical chemistry, optical spectroscopy, mass spectrometry, electrochemistry, thermodynamics, quantum chemistry, and polymer chemistry.

Upon arrival, new graduate students in Chemistry take examinations in analytical, inorganic, organic, and physical chemistry in order to place students properly in the graduate curriculum. The exams are nationally standardized by the American Chemical Society, and national norms are used. Appropriate course work and didactic opportunities are in place to strengthen any student weakness that may appear from the exams.

Early in the fall semester faculty present a series of short talks that describe their research interests. New graduate students attend these talks and then discuss specific research interests with individual faculty members. After this process, students normally make a decision regarding their research direction and particular advisor around the end of November of the first year. Detailed information about the degree requirements of the program can be found via the Graduate Program link of the Chemistry Department's website.

DEGREES

Chemistry AMP

Chemistry M.S.

Chemistry Ph.D.

FACULTY

Brewer, Matthias; Professor, Department of Chemistry; PHD, University of Wisconsin-Madison
Hondal, Robert J.; Associate Professor, Department of Biochemistry; PHD, Ohio State University
Landry, Christopher C.; Professor, Department of Chemistry; PHD, Harvard University
Liptak, Matthew D.; Associate Professor, Department of Chemistry; PHD, University of Wisconsin-Madison
Madalengoitia, Jose S.; Associate Professor, Department of Chemistry; PHD, University of Virginia
Matthews, Dwight E.; Professor Emeritus, Department of Chemistry; PHD, Indiana University Bloomington
Ou, Yangguang; Assistant Professor, Department of Chemistry, PHD, University of Pittsburgh
Petrucci, Giuseppe A.; Professor, Department of Chemistry; PHD, University of Florida
Punihaole, David; Assistant Professor, Department of Chemistry, PHD, University of Pittsburgh
Waterman, Rory; Professor, Department of Chemistry; PHD, University of Chicago

Courses

CHEM 5300. Topics in Analytical Chemistry. 1-3 Credits.
Selected topics of current interest in analytical chemistry. New techniques and methodologies, especially in chemical instrumentation. See Schedule of Courses for specific titles. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: Graduate student.

CHEM 5320. Gr Instrumental Analysis. 3 Credits.
Systematic survey of modern methods of chemical analysis. Fundamental principles and applications of spectroscopy, electrochemistry, and separation techniques. Credit not awarded for both CHEM 5320 and CHEM 3320. Prerequisite: Graduate student.

CHEM 5400. Gr Advanced Inorganic Chem. 3 Credits.
Molecular symmetry and group theory with an emphasis on applications (vibrational and electronic spectra, bonding and reactivity); introduction to transition metal processes; bioinorganic chemistry. Credit not awarded for both CHEM 5400 and CHEM 3400. Prerequisite: Graduate student.

CHEM 5580. Gr Advanced Organic Chem 1. 3 Credits.
Stereochemistry, conformational analysis, stereoelectronic effects, transition state theory, molecular orbital theory, and reactivity criteria are discussed in regards to reaction mechanisms and functional group manipulations. Credit not awarded for both CHEM 5580 and CHEM 4580. Prerequisite: Graduate student.

CHEM 5600. Gr Advanced Physical Chemistry. 3 Credits.
Advanced exploration of quantum chemistry, thermodynamics, and kinetics, with a significant level of mathematical rigor. Credit not awarded for both CHEM 5600 and CHEM 3600. Prerequisites: MATH 2248 or equivalent; Graduate student.

CHEM 5610. Gr Chemical Thermodynamics. 3 Credits.
Calculus-based exploration of the fundamental principles of thermodynamics (gases, equilibrium, free energy, laws of thermodynamics, statistical thermodynamics, phase transitions, mixtures, chemical reactions, solids), from an interdisciplinary perspective. This topic is a cornerstone of many scientific and engineering disciplines. Appropriate for students in Chemistry and other STEM fields. Prerequisites: Graduate student or Instructor permission; content knowledge of general chemistry, calculus, and introductory physics (mechanics) assumed. Cross-listed with: MATS 5610.

CHEM 5990. Special Topics. 1-18 Credits.
Selected topics of current interest that do not fall into one of the traditional areas of Chemistry.

CHEM 6010. Intro to Graduate Research. 1 Credit.
Introduction to graduate research in Chemistry. Overview of faculty research areas and department/university research resources. Prerequisite: Chemistry Graduate student.

CHEM 6015. Chemical Investigations. 1 Credit.
Current problems and literature. Prerequisite: Chemistry Graduate student.

CHEM 6020. Grad Seminar. 1 Credit.
Current problems and literature. Prerequisite: Chemistry Graduate student.

CHEM 6050. Topics in Current Chemistry. 0 or 1 Credits.
Survey of current topics in the Chemistry literature. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisite: Chemistry Graduate student.

CHEM 6300. Topics in Analytical Chemistry. 3 Credits.
Selected topics of current interest in analytical chemistry. New techniques and methodologies, especially in chemical instrumentation. See Schedule of Courses for specific titles. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisite: Graduate student.

CHEM 6391. Master's Lab Thesis Research. 1-18 Credits.
Research for the Master's Thesis.

CHEM 6392. Master's Lit Project Research. 1-12 Credits.
Reading and literature research culminating in the preparation of a comprehensive and critical review of a topic of current interest in Chemistry.

CHEM 6395. Advancement to Candidacy Exam. 2 Credits.
Students demonstrate the comprehensive, fundamental knowledge, in the context of their research, needed to pursue a Ph.D. degree. Preparation of a dossier consisting of an extensive introduction to the dissertation, a detailed record of research progress, and future directions. Culminates in the Advancement to Candidacy Examination, which includes a presentation and a comprehensive oral examination. Prerequisite: CHEM 6015.

CHEM 6400. Topics in Inorganic Chemistry. 1-3 Credits.
Areas of current interest involving inorganic systems, particularly catalysis, solid state chemistry, and bioinorganic chemistry. See Schedule of Courses for specific titles. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: CHEM 3400.

CHEM 6410. Organometallic Chemistry. 3 Credits.
Synthesis, structure, bonding, properties, reactions, and applications of organometallic systems; mechanisms of organometallic reactions including oxidative addition and insertion reactions with applications in catalysis. Prerequisite: Chemistry Graduate student.

CHEM 6460. Physical Inorganic Chemistry. 3 Credits.
Determination of molecular and electronic structure of inorganic complexes using spectroscopic techniques. Introduction to magnetism. Interpretation of spectroscopic data within the frameworks of group theory and electronic structure calculations. Prerequisite: Chemistry Graduate student.

CHEM 6500. Topics in Organic Chemistry. 1-3 Credits.
Advanced level discussion of specific topics in organic chemistry of current interest such as photochemistry, carbenes, bioorganic chemistry, magnetic resonance, etc. See Schedule of Courses for specific titles. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisite: Chemistry Graduate student.

CHEM 6580. Advanced Organic Chemistry 2. 3 Credits.
Modern synthetic organic methods and approaches to multi-step synthesis are discussed. Selected total syntheses are reviewed to highlight important concepts including diastereoselective and enantioselective processes. Prerequisite: Chemistry Graduate student.

CHEM 6600. Topics in Physical Chemistry. 1-3 Credits.
Selected topics of current interest in physical chemistry. See Schedule of Courses for specific titles. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: CHEM 3600.

CHEM 6620. Computational Chemistry. 3 Credits.
Explores the techniques and applications of computational chemistry to model organic, inorganic, and biological molecules. Introduces basic level of classical and quantum modeling, cheminformatics and big chemical data, as well as computer-aided design of new materials and medicines. Prerequisite: Chemistry Graduate student.

CHEM 6990. Special Topics. 1-18 Credits.
See Schedule of Courses for specific titles.

CHEM 6991. Internship. 1-18 Credits.
On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

CHEM 6993. Independent Study. 1-18 Credits.
A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

CHEM 6994. Teaching Assistantship. 1-3 Credits.
Student service as a teaching assistant, usually in an introductory-level course in the discipline, for which credit is awarded. Offered at department discretion. Prerequisite: Instructor permission.

CHEM 6995. Graduate Independent Research. 1-18 Credits.
Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

CHEM 7010. Research Problem Conception. 1 Credit.
Identification of a current research problem to be addressed by original, independent research. Prerequisite: Chemistry Graduate student.

CHEM 7015. Research Problem Solution. 1 Credit.
Solution to a current research problem to be addressed by original, independent research. Prerequisite: CHEM 7010.

CHEM 7491. Doctoral Dissertation Research. 1-18 Credits.
Research for the Doctoral Dissertation.

CHEM 7990. Special Topics. 1-18 Credits.
See Schedule of Courses for specific titles.