CHEMISTRY

College of Science, Engineering, and Technology
Department of Chemistry and Geology
242 Trafton Science Center N • 507-389-1963
Web site: http://cset.mnsu.edu/chemgeol/

The Department of Chemistry and Geology does not offer graduate programs. Graduate courses are available that might supplement other graduate programs or be part of a cross-disciplinary studies program. Graduate courses in the Department of Chemistry and Geology offer students an opportunity to strengthen their academic education in the field of chemistry and to develop the necessary research skills for future careers.

COURSE DESCRIPTIONS

CHEM 507 (3) Water Chemistry
A broad introduction to the chemistry of natural waters and chemical analysis of such systems. Topics covered may include: macromolecular analytes, organic analytes, inorganic analytes, major component/minor component/trace component determinations, matrix effects, equilibrium processes, modeling of chemical/physical transport, regulatory monitoring, and compliance issues. Laboratory exercises will provide students with goal-orientated, cooperative experiences in sampling and measurement of complex samples.
Prerequisite: CHEM 305 (or equivalent) V

CHEM 513 (3) Advanced Inorganic Chemistry
A survey of topics in inorganic chemistry including quantum mechanics, symmetry and group theory, solid state chemistry, molecular structure and geometry, bonding theories, and coordination chemistry emphasizing the theoretical foundation.
Prerequisite: CHEM 440/540 (or equivalent) F

CHEM 515 (2) Inorganic Preparations
The preparation and study of inorganic/organometallic compounds utilizing a variety of synthetic techniques including common Schlenk technique. The studies will include characterization by common instrumental methods such a IR, NMR, and UV-vis spectroscopy. Additional studies using instrumental techniques such as IR, NMR, UV-vis, electrochemistry, and magnetic susceptibility will also be conducted.
Prerequisite: CHEM 413/513 previously or concurrently S

CHEM 523 (4) Spectroscopic Determination of Structure
Spectroscopic techniques including nuclear magnetic resonance, infrared, and mass spectrometry for determining structural features of molecules will be covered. Spectroscopic methods emphasize interpretation of spectra and also provide hands-on operation of the corresponding electronic instruments. The laboratory uses these techniques for the determination of the structures of a series of unknown compounds.
Prerequisite: CHEM 321 and 331 (or equivalent) F

CHEM 524 (3) Advanced Organic Chemistry
Advanced synthetic organic reactions and their mechanisms. Laboratory will include examples of some of this chemistry and techniques for reaction monitoring and product purification.
Prerequisite: CHEM 331 (or equivalent) S-E

CHEM 534 (2) Industrial Chemistry
The synthesis and properties of organic macromolecules, especially industrially important polymers, and the chemistry of other industrially important chemical reactions and processes.
Prerequisite: CHEM 321 (or equivalent) S-O

CHEM 537 (4) Food Chemistry
This lecture laboratory course will cover the fundamental principles of food chemistry. Chemical and physical properties of major and minor food components will be discussed. The laboratory will involve both traditional wet chemical methods and more sophisticated instrumental analyses.

CHEM 540 (3) Physical Chemistry I
Detailed treatment of thermodynamics and chemical kinetics. Topics include equations of state, laws of thermodynamics, statistical thermodynamics, phase and reaction equilibrium, thermodynamics of solutions and electrochemistry, transport properties, and reaction kinetics.
Prerequisite: CHEM 305, 321, one year of physics, MATH 121 (or equivalent) F

CHEM 541 (3) Physical Chemistry II
Detailed treatment of quantum mechanics, spectroscopy, and statistical mechanics. Topics include the foundations of quantum mechanics, application of quantum mechanics to atomic and molecular structure, foundations of spectroscopic techniques, and statistical mechanics. The course concludes with a treatment of molecular reaction dynamics based on primary literature.
Prerequisite: CHEM 440/540, MATH 122 (or equivalent) S

CHEM 545 (2) Advanced Physical Chemistry
Integrated application of the content from 440 and 441 to an applied topic of interest to the instructor. The course will depend heavily on reading and discussion of the current primary literature of physical chemistry. Possible topics include: atmospheric chemistry, thermodynamics of protein folding, catalytic processes, or molecular processes at interfaces.
Prerequisite: CHEM 441/541 V

CHEM 550 (1) Physical Chemistry Laboratory I
Laboratory to accompany 540. An advanced treatment of measurement theory and data analysis precedes a series of thermodynamic and kinetic experiments designed to complement topics treated in lecture to help students develop more independence and sophistication in planning, performing, and reporting experimental work.
Prerequisite: CHEM 440/540 previously or concurrently F

CHEM 551 (1) Physical Chemistry Laboratory II
Laboratory to accompany 541. Experiments and computational projects in quantum mechanics, spectroscopy, and statistical mechanics. The experiments and projects will continue to work toward the goal of increasing the students independence and sophistication.
Prerequisite: CHEM 441/541 previously or concurrently S

CHEM 560 (3) Biochemistry I
Detailed analysis of the structures, properties, and functions of proteins, carbohydrates, lipids, and nucleic acids; theory for the purification and analysis of proteins and nucleic acids. Concurrent enrollment in CHEM 565 is recommended.
Prerequisite: CHEM 321 and 331, and BIOL 105 and 106 (or equivalent) F

CHEM 561 (3) Biochemistry II
Detailed analysis of the reactions involved in intermediary metabolism, translation, and replication.
Prerequisite: CHEM 460/560 (or equivalent) S

CHEM 565 (1) Biochemical Techniques I
A lecture/laboratory course which presents methodology and instrumentation used to purify and analyze biomolecules. Techniques include chromatography, autoradiography and radioisotope techniques, agarose and polyacrylamide gel electrophoresis, and spectrophotometry.
Prerequisite: CHEM 460/560 previously or concurrently.
CHEM 305 is recommended. F

CHEM 566 (2) Biochemical Techniques II
Students work in teams to solve biochemical research problems by conducting and analyzing experiments which they design.
Prerequisite: CHEM 460/560 and 465/565 S

CHEM 574 (2) Chromatography
Theory and applications of thin layer, paper, liquid, and gas chromatography.
Prerequisite: CHEM 320 previously or concurrently is recommended F-E

CHEM 575 (4) Instrumental Analysis
Theory and practice of modern instrumental methods including basic electronics. Special emphasis placed on sampling methods, analog and digital electronics, electrochemistry, spectrophotometric and chromatographic methods, surface and thin-film analysis, and computer acquisition and data processing techniques.
Prerequisite: CHEM 305; PHYS 212 or 222 previously or concurrently S

CHEM 577 (1-3) Special Topics in Instrumental Analytical Chemistry
Detailed study and focused discussion of a specific analytical technique such as electrochemistry, X-ray analysis, etc., or an area of analysis such as metals, bioanalytical, etc. May be taken more than once for credit, if the topic is different.
Prerequisite: CHEM 305 (or equivalent) V

CHEM 579 (4) Teaching Physical Science
Methods and materials for teaching physical sciences in middle school through high school. Clinical experiences required for the course.
Prerequisite: consent S

CHEM 582 (1-3) Problems in Teaching Science
Investigation of current issues and topics related to the teaching of science in K-12 grades.
V

CHEM 585 (1-2) Seminar in Environmental Chemistry
Study of current environmental problems or issues with emphasis on the relevant chemical principles and understanding necessary to monitor or alleviate the problems.
Prerequisite: CHEM 305 (or equivalent) V

CHEM 590 (1-6) Workshop

CHEM 591 (1-6) In-Service

CHEM 597 (1-16) Internship

CHEM 602 (1-6) Topics: Analytical Chemistry
Recent advances in analytical chemistry or detailed study of advanced techniques or areas of analytical chemistry. This course may be taken more than once for credit if the topic is different.
Prerequisite: CHEM 305 (or equivalent) V

CHEM 616 (1-6) Topics: Inorganic Chemistry
Topics from inorganic chemistry which may included such fields as bioinorganic chemistry, organometallic chemistry, solid state chemistry, and other topics of current interest. This course may be taken more than once for credit if the topic is different.
Prerequisite: CHEM 413/513 (or equivalent) V

CHEM 621 (2-6) Topics: Organic Chemistry
Topics may include the chemistry of heterocyclic compounds or natural products, control of stereochemistry, photochemistry, advanced NMR techniques, or other areas of current interest not covered in other courses. This course may be taken more than once for credit if the topic is different.
Prerequisite: CHEM 321 and 331 (or equivalent) V

CHEM 642 (2-6) Topics: Physical Chemistry
Advanced consideration of some fundamental area in physical chemistry with application to a topic of current interest to the instructor and students. The course will depend on reading and discussion of current primary literature. Possibilities include: quantum mechanics and molecular structure calculations, condensed phase structure, development of novel materials, etc.
Prerequisite: CHEM 442/542 (or equivalent) V

CHEM 660 (2-6) Topics: Biochemistry
Detailed study of the literature in one selected area of biochemistry. This course may be taken more than once for credit if the topic is different.
Prerequisite: CHEM 461/561 (or equivalent) V

CHEM 677 (1-6) Individual Study
CHEM 682 (2) Chemistry for the Elementary Teacher

CHEM 685 (1-3) Laboratory Supervision & Maintenance

CHEM 690 (1-6) Workshop

CHEM 692 (1-6) Research

CHEM 694 (1-2) Alternate Plan Paper

CHEM 695 (1-2) Graduate Seminar
Students will present a seminar on either a research proposal for their graduate research or the results of their thesis research.
S

CHEM 698 (1-8) Internship

CHEM 699 (3-6) Thesis