CHEMISTRY

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Chair
Yuanbing Mao

Associate Chair
Benjamin Zion

Faculty with Research Interests
For more information regarding faculty visit the Department of Chemistry website.

The Department of Chemistry offers graduate programs leading to the M.S. and Ph.D. degrees in chemistry. Each student's program is planned individually to meet individual needs, interests, and capabilities. The aim of these programs is to develop chemists who are able to think creatively and critically.

Each new graduate student is assigned a graduate student adviser and must obtain the approval of the adviser each semester before registering for any classes.

Research Centers

International Center for Sensor Science and Engineering (ICSSE)

Research Facilities

The department has state-of-the-art computer and laboratory equipment and conducts research in the areas of analytical chemistry, biological chemistry, computational chemistry, inorganic chemistry, materials chemistry, organic chemistry, polymer chemistry, surface chemistry, physical chemistry, and medicinal chemistry. The department has a strong collaboration with Argonne National Laboratory that provides access to an array of advanced research and instrumentation facilities. On-campus research facilities include x-ray diffraction facilities, a high-field nuclear magnetic resonance facility, state-of-the-art inorganic-, organic- and polymer synthesis and characterization laboratories, Fourier transform infrared spectrometers, Raman spectrometer, atomic force microscope, fluorescence microscope, mass spectrometers, facilities for high-pressure liquid chromatography and gas chromatography, and high-performance computer clusters. Collaborative programs are carried on with Argonne National Laboratory and the Advanced Photon Source. The department is home to ICSSE, whose mission is to bring researchers from academia, industry, and research labs together to provide an interdisciplinary environment for broader areas of sensor research.

Department Graduate Examinations

All full-time students in the Ph.D. program are required to take and pass the oral Ph.D. qualifying examination after completing the core course requirement by the end of their fourth semester of study. Part-time students must pass this examination by a comparable stage of their programs. This examination consists of a presentation before a faculty committee about a recent research paper. It may be taken up to once per semester and a maximum of two times. After the presentation, the committee will evaluate the student's performance on coursework, research, and the oral examination. Students passing this examination at the Ph.D. level are judged to be qualified to continue in the Ph.D. program. M.S. with thesis students fulfill their comprehensive exam requirement with their thesis defense. M.S. non-thesis students may fulfill their comprehensive exam requirement with an oral examination following the adviser's instruction. M.S. students may also choose to take the oral Ph.D. qualifying examination. Students passing the examination at the Ph.D. level may pursue readmission to the Ph.D. program.

All students in the Ph.D. program who have passed the oral qualifying examination must take and pass a comprehensive examination at least a year prior to their thesis defense. This examination consists of a written proposal, an oral presentation, and a defense of the proposal before a faculty committee. A student may take this examination a maximum of two times. Students passing this examination may continue with their research and will receive a Ph.D. upon satisfactory completion of all other required courses and general requirements of the Graduate College, a written dissertation, and final oral thesis defense.

All students in the professional master's degree program are required to take and pass a comprehensive exam. Students may sit for the exam a limited number of times.

Admission Requirements

Minimum Cumulative Undergraduate GPA

3.0/4.0

Minimum GRE Scores

The Graduate Record Examination (GRE) is required for all applicants except Master of Chemistry applicants who have earned an undergraduate degree from an accredited U.S. institution with a GPA of 3.0 or above.

- Master of Chemistry/Master of Science: 300 (quantitative + verbal), 2.5 (analytical writing)
- Ph.D.: 310 (quantitative + verbal), 3.0 (analytical writing)

Minimum TOEFL Scores

80/550 (internet-based/paper-based test scores)

Applicants to the doctoral program are strongly encouraged to submit the subject-area GRE score (subject no. 27). Meeting the minimum GPA and test score requirements does not guarantee admission. Test scores and GPA are just two of several important factors considered. Applicants are expected to have a bachelor's degree from an accredited institution with a major in that same discipline, or a closely allied major with additional coursework that prepares the student for graduate study in the chosen program. Students who have not completed all required courses may be accepted for general admission and can begin coursework, but must remove any deficiencies before the Master of Chemistry and M.S. comprehensive/Ph.D. qualifying examination.

Degrees Offered

- Master of Chemistry in Materials Chemistry
- Master of Science in Analytical Chemistry
- Master of Science in Chemistry
- Doctor of Philosophy in Chemistry

Certificate Programs

- Analytical Method Development
- Analytical Spectroscopy
- Chromatography
- Materials Chemistry
- Regulatory Science

Course Descriptions

CHEM 500
Advanced Analytical Chemistry
An overview of analytical chemistry with discussions of complex ionic equilibria, electro analytical techniques including potentiometric, voltametric, coulometric and conductometric methods, ion chromatography, capillary electrophoresis and sensor technology.
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 501
Capstone Project
This course will educate students in the area of quality process and quality manufacturing. Student will work with the instructor to plan and conduct research on a project that is relevant to the analytical chemistry program of study. The project must be approved by the Master of Chemistry in Analytical Program Director.
Lecture: 1 **Lab:** 3 **Credits:** 2

CHEM 503
Survey of Analytical Chemistry
This course covers modern aspects of chemical analysis. It is designed to give the student a solid conceptual ground to understand how a given analytical technique works including its limits and advantages. The emphasis is on solutions analysis and the course is roughly divided into: (i) Basic measurements and concepts; (ii) spectroscopy; and (iii) chromatography and mass spectrometry. Upon completion of this course, the student will be able to: describe the basic setup and operation of separation, mass spectrometric, and spectroscopic instrumentation; interpret spectra from various instruments as a means for qualitative and quantitative analysis; apply basic knowledge of separation technique, mass spectrometry, and spectroscopy for practical problem solving; relate the use of separation technique, mass spectrometry, and spectroscopy to his or her own research interests; and compile, present, and explain modern techniques for analytical research. Topics includes high-performance liquid chromatography, gas chromatography, atomic spectrometry, molecular spectrometry, UV/vis spectroscopy, molecular luminescence, infrared spectrometry, mass spectrometry, radio chemistry, raman spectroscopy, nuclear magnetic resonance spectroscopy, etc.
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 505
Spectroscopic Methods I
Theories of spectroscopic transitions and their applications in structural elucidations and quantitative analysis. Topics include ultraviolet/visible, infrared, Raman and nuclear magnetic resonance spectroscopy and mass spectrometry.
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 506
Sampling and Sample Preparation
Techniques and devices for sampling in diverse media will be treated, followed by a discussion of sample treatment prior to analysis including isolation, concentration, and fractionation of analytes and classes of analytes.
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 508
Analytical Methods Development
A seminar course presenting analytical methods in complex matrices with emphasis on methods development and validation.
Lecture: 2 **Lab:** 0 **Credits:** 2

CHEM 509
Physical Methods of Characterization
A survey of physical methods of characterization including x-ray diffraction and fluorescence surface techniques including SEM, TEM, AES and ESCA, thermal methods and synchrotron radiation methods.
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 510
Electronics and Interfacing
Elementary circuit analysis, operational amplifiers, digital electronics, signal processing and interfacing of instruments using modern computer software and hardware.
Lecture: 2 **Lab:** 0 **Credits:** 2

CHEM 512
Spectroscopic Methods II
A continuation of the study of optical methods covering atomic absorption spectroscopy, atomic and flame emission spectroscopy, chemiluminescence, fluorescence, phosphorescence, light scattering and refractometry.
Lecture: 2 **Lab:** 0 **Credits:** 2

CHEM 513
Chemometrics and Statistics in Chemistry
This course is carefully designed to provide a vigorous training on statistical methods to graduate students and industry professionals for analysis of real life projects so they can function effectively as part of an innovative and scientific community. The topics include, but not limited to, advanced error analysis, statistical inference, hypothesis testing, probability density functions, sampling estimation, applied regression and multivariable methods, non-parametric analysis, outlier identification methods, and optimization and experimental design. In this course, an advanced statistical software program is introduced with example problems for comprehensive analysis of data and interpretation of the results. The course also discusses various topics for scientific interpretation of data set for chemical, environmental, and biological engineering disciplines.
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 515
Gas Chromatography -- Theory and Practice
This course will cover theory and concepts of gas chromatographic analysis and its practical application in solving analytical problems. Topics include basic theory of chromatographic separation, separation dynamics, instrumentation, column selection, quantitative techniques, and practical applications.
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 516
Liquid Chromatography -- Theory and Practice
This course will cover the operating principles and applications of state-of-the-art LC/HPLC instrumentation and analysis. Topics include basic theory of liquid chromatography, instrumentation, optimization of LC separation, quantitative techniques, and the diverse range of analytical applications amenable to LC analysis.
Prerequisite(s): CHEM 515 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 518
Understanding the International Conference on Harmonization Guidelines
The International Conference on Harmonization (ICH) was revolutionized in the 1980's to provide a forum for the pharmaceutical industry to discuss regulatory requirements for registration of new chemical entity. These guidelines have been significantly influenced the content of FDA draft guidelines to develop the scientific information and manufacturing controls. Thus, proper understanding of these guidelines is essential in the drug development process. This course will be designed to focus exclusively on guidelines associated with the registration of small molecules. Completing this course, students will understand the expectations set forth in various FDA and ICH quality topics in order to implement these guidelines and/or engage the regulatory agencies in dialogue in order to provide justification of data or present clear scientific rationale.
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 519
Good Manufacturing Practices
This course provides an introduction to current good manufacturing practices (GMP) regulations and their implementation to different areas of the manufacturing process such as laboratory records, equipment, personnel, facilities, etc. The course will help students to recognize the regulatory actions and financial risks for non-compliance.
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 520
Advanced Inorganic Chemistry
Selective treatment of the chemistries of main group and transition elements with emphasis on coordination complexes, organometallic compounds and inorganic cages and clusters. Discussions of molecular symmetry, stereochemistry, bonding, electronic spectra, magnetic properties, reactions, kinetics and reaction mechanisms are included.
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 521
Structural Inorganic and Materials Chemistry
This course covers structure and bonding and structure-property relationships in inorganic molecules and solids. Descriptions of crystal structures, spectroscopic and x-ray diffraction techniques for structure determination and properties of solids are included.
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 522
Efficient Chemical and Materials Synthesis
The design and development of environmentally benign chemical pathways: challenges and opportunities. High-yield and zero-waste chemical processes. Representative processes.
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 524
Synthesis and Intellectual Property Management
This course focuses on the management of intellectual property. Professionals will lead discussions on the control and dissemination of materials concerning intellectual property. This will be combined with the technical presentations by the students in the classroom. Topics of discussion will include invention disclosures, intellectual property rights, proprietary materials, justification for patents, types of patents, the terms of a patent, patents procedure, licensing procedure and security considerations. Access to patented materials and disclosure of materials under patent process will be covered.
Lecture: 2 **Lab:** 0 **Credits:** 2

CHEM 526
Graduate Chemistry Laboratory
An advanced laboratory with emphasis on synthesis and characterization of inorganic and organometallic compounds.
Lecture: 1 **Lab:** 7 **Credits:** 3

CHEM 530
Organic Reaction Mechanisms
A study of important mechanism classes and their relationship to the major reactions of organic chemistry. Emphasis will be placed on the study of reaction intermediates and on the methods used to characterize reaction pathways. Topics will include chemical bonding, aromaticity, stereochemistry, substitution, elimination, carbanion chemistry, free radical reactions, photochemistry and concerted reactions.
Prerequisite(s): CHEM 455 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 531
Tactics in Organic Synthesis
A study of modern synthetic strategies used in the preparation of complex organic molecules. Synthetic planning using the disconnection approach and the selection of reagents to solve regiochemical and stereo chemical problems will be the underlying themes. Synthetic strategies to be discussed include tandem reactions, template and chelation effects, biomimetic tactics and the use of chiral terpenes, carbohydrates and amino acids in enantioselective syntheses. Target molecules will include natural products, pharmaceuticals and smart organic materials.
Prerequisite(s): CHEM 530 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 534
Advanced Spectroscopic Methods
Characterization and analysis by mass, vibrational, nuclear magnetic resonance, and electronic spectroscopy. Structure spectra correlations applied to organic and inorganic compounds with examples drawn from diverse areas, e.g., pollutants, toxic materials, polymers, etc.
Lecture: 3 **Lab:** 4 **Credits:** 4

CHEM 535
Polymer Synthesis
This course will cover the basics of polymer synthesis including traditional polymerization techniques, such as free-radical and ionic chain polymerizations, and step-growth polymerization. Newer methods of polymer synthesis, such as ring-opening metathesis and controlled free-radical polymerizations, will also be discussed. Students will be introduced to the methods of preparation of advanced polymer structures, such as block, star and brush copolymers, dendrimers, and hyperbranched polymers.
Prerequisite(s): CHEM 239 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 537
Polymer Chemistry Laboratory
This course will include the synthesis of a variety of polymers and their characterization using instrumental methods. Emphasis will be placed on factors that control polymer formation, methods for obtaining molecular weights and distributions of polymers, as well as thermal and mechanical characteristics of polymers.
Prerequisite(s): CHEM 470 with min. grade of C
Lecture: 1 **Lab:** 6 **Credits:** 3

CHEM 538
Physical Biochemistry
The course will cover the principles and techniques of physical chemistry applied to biological macromolecules. Topical concepts include thermodynamics, kinetics, and quantum chemistry. Applications to areas such as interpretation of entropy and enthalpy driven processes, biochemical equilibrium, phase transitions in lipid, bilayers and membranes, enzyme kinetics, intra- and intermolecular interactions, and spectroscopy of proteins and nucleic acids will be introduced.
Prerequisite(s): CHEM 239 with min. grade of C and CHEM 344 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 539
Introduction to Pharmaceutical Chemistry
Fundamental concepts will be discussed, including modern principles of drug design; drug absorption, distribution and metabolism; theories of drug-receptor interactions; approaches to structure-activity relationships; chemical, physicochemical and structural considerations. The various classes of therapeutic agents will be surveyed with emphasis on possible modes of action. Methods of synthesis will be considered.
Prerequisite(s): CHEM 239 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 542
Polymer Characterization and Analysis
This course will provide an overview of the common techniques for polymer characterization, studying structure-property relationships, and polymer morphology. The course will focus on thermal and mechanical characterization of polymers as well as polymer rheology. Examples and uses of major commercial polymers and advanced functional polymers will be introduced.
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 543
Analytical Chemistry in Pharmaceutical Laboratories
This course is designed to compliment the current curriculum of the professional master degree in analytical chemistry. It is a review of the requirements a student may face as a professional chemist in a regulated industry. The course focus is on the requirements and common topics facing today's pharmaceutical industry. While individual agencies have specific regulations, the fundamental ideas of these regulations are largely consistent across the board. For example, an analytical chemist versed in Good Laboratory Practices (GLP) under FDA can quickly pick up the GLP's required by EPA.
Lecture: 2 **Lab:** 0 **Credits:** 2

CHEM 544
Colloids and Colloid Analysis
This course will begin a general overview of colloid science. This part of the course will introduce various types of colloids, touch on factors and conditions leading to their stability or instability, consider their evolution and will include a very limited discussion of the conditions under which they can form. The second part of the course will consist of a series of discussions of specific analytical techniques used to characterize colloidal systems, with particular emphasis on the physical characterization of the dispersed phase.
Lecture: 2 **Lab:** 0 **Credits:** 2

CHEM 548
Electrochemical Methods
Thermodynamics and potential, charge-transfer kinetics and mass transfer. Potential step and potential sweep methods, including hydrodynamic methods. Bulk electrolysis methods. Electrode reactions coupled with homogeneous chemical reactions. Double-layer structure and absorbed intermediates in electrode processes. Digital simulation of electrochemical processes. Students are expected to have some background in the physical chemistry of solutions and electroanalytical chemistry at the level of CHEM 500.
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 550
Chemical Bonding
Review of the postulatory basis of quantum mechanics and application to 1-D and 3-D systems. Hydrogenic and symmetry-adapted spin orbitals and bond formation. Ground and excited states. Commonly used semiempirical molecular orbital methods.
Prerequisite(s): CHEM 344 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 552
Chemical Kinetics
Types of reactions, reaction order, activation energy, transition states, isotope effects and the mechanism of reactions. Determination of the rates of free radical reactions. Primary processes in thermal, photochemical and other radiation-induced reactions.
Prerequisite(s): CHEM 553 with min. grade of C and CHEM 550 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 553
Chemical Statistical Thermodynamics and Molecular Simulation
Statistical interpretation of the fundamental properties and laws of thermodynamics. Ensembles, partition functions, and principles of molecular simulation. Applications to chemical and phase equilibria including case studies from contemporary literature.
Prerequisite(s): CHEM 343 with min. grade of C and CHEM 344 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 560
Advanced Chemistry Projects
Advanced chemistry projects to be carried out under the direction of a faculty member. These projects may involve computational, theoretical, experimental work or a combination of these. Projects based on experimental work may be carried out in the research lab of the instructor. Topics of the advanced projects will be selected by the faculty member offering the course and will not necessarily be related to the dissertation topic of the student. May be taken more than once and up to 12 credit hours.
Credit: Variable

CHEM 561
Laboratory Rotations
This course requires each student to complete research rotations in three different laboratories, 4 weeks in each lab. It allows students to explore various areas of chemical research before committing to a single lab to conduct thesis research. The course intends to give students an opportunity to learn what research topics excite them, what techniques they favor and what lab environment is a good fit. At the same time, rotations provide faculty the mechanism for evaluating students as candidates to join their lab. Submission of a report is required upon the completion of each rotation.
Lecture: 0 **Lab:** 9 **Credits:** 3

CHEM 584
Graduate Seminar in Chemistry
To foster scientific communications skills, students are required to present seminars based on the scientific literature. Required of all first year M.S. and PhD students.
Lecture: 0 **Lab:** 1 **Credits:** 1

CHEM 585
Chemistry Colloquium
Lectures by invited scientists in areas of chemistry generally not covered in the department. Must be taken two time by M.S. students and four time by PhD. students.
Lecture: 0 **Lab:** 1 **Credits:** 1

CHEM 591
Research and Thesis
(Credit: Variable)
Credit: Variable

CHEM 594
Special Problems
Designed for non-thesis M.S. only. (Credit: Variable)
Credit: Variable

CHEM 596
Chemistry for Teachers-Elementary
Certification as chemistry teacher or approval of instructor. An in-service workshop for pre-college teachers emphasizing the phenomenological approach to the teaching of chemical science. (Credit: variable)
Credit: Variable

CHEM 597
Reading and Special Problems
Independent study to meet the special needs of graduate students in department-approved graduate degree programs. Requires the written consent of the instructor. May be taken more than once. Receives a letter grade. (Credit: Variable)
Credit: Variable

CHEM 598
Chemistry for High School Teachers
Certification as teacher or approved of instructor. An in-service workshop for pre-college teachers emphasizing the phenomenological approach to teaching of chemical science at the high school level. (Credit: variable)
Credit: Variable

CHEM 600
Continuation of Residence
Lecture: 0 **Lab:** 0 **Credits:** 1

CHEM 610
Special Topics in Analytical Chemistry
Topics of current interest in analytical chemistry including advanced electro-chemistry, surface spectroscopy of electrode surfaces, separations, laboratory automation and new spectroscopic techniques.
Lecture: 2 **Lab:** 0 **Credits:** 2

CHEM 611
Special Topics in Analytical Chemistry
Topics of current interest in analytical chemistry including advanced electro-chemistry, surface spectroscopy of electrode surfaces, separations, laboratory automation and new spectroscopic techniques.
Lecture: 2 **Lab:** 0 **Credits:** 2

CHEM 620
Special Topics in Inorganic Chemistry
Topics of current interest in inorganic chemistry, including organometallic chemistry, homogeneous catalysis, inorganic reaction mechanisms, inorganic stereochemistry, materials chemistry, x-ray crystallography, synthetic and physical methods in inorganic and materials chemistry and chemical applications of group theory.
Lecture: 2 **Lab:** 0 **Credits:** 2

CHEM 621
Special Topics in Inorganic Chemistry
Topics of current interest in inorganic chemistry, including organometallic chemistry, homogeneous catalysis, inorganic reaction mechanisms, inorganic stereochemistry, materials chemistry, x-ray crystallography, synthetic and physical methods in inorganic and materials chemistry and chemical applications of group theory.
Lecture: 2 **Lab:** 0 **Credits:** 2

CHEM 630
Special Topics in Organic Chemistry
Topics of current interest in organic chemistry including photochemistry, fluorine chemistry, heterocyclic chemistry, pharmaceutical chemistry and electro optical organic chemistry.
Prerequisite(s): CHEM 455 with min. grade of C
Lecture: 2 **Lab:** 0 **Credits:** 2

CHEM 631
Special Topics in Organic Chemistry
Topics of current interest in organic chemistry including photochemistry, fluorine chemistry, heterocyclic chemistry, pharmaceutical chemistry and electro optical organic chemistry.
Prerequisite(s): CHEM 455 with min. grade of C
Lecture: 2 **Lab:** 0 **Credits:** 2

CHEM 635
Heterocyclic Chemistry
Of the vast array of structures which organic compounds adopt, many contain ring systems as a component. When the ring is made up of carbon and at least one other element, the compound is classified as a heterocycle. The aims of this course are to identify the effects that the presence of such ring systems have on the chemistry of a molecule; to show how the rings can be made, and to describe some of the uses of the compounds in organic synthesis, in medicine and in other contexts. The chemistry of aromatic five-, six- and seven-membered ring compounds with one or more nitrogen, oxygen and/or sulfur atoms will be emphasized.
Prerequisite(s): CHEM 239 with min. grade of C and CHEM 455 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

CHEM 650
Special Topics in Physical Chemistry
Topics of current interest in physical chemistry, including atmospheric chemistry, ion molecule reactions, laser chemistry, theories of gas phase reactions, scattering theory, interaction of radiation with matter and time-dependent relaxation methods.
Lecture: 2 **Lab:** 0 **Credits:** 2

CHEM 651
Special Topics in Physical Chemistry
Topics of current interests in physical chemistry, including atmospheric chemistry, ion molecule reactions, laser chemistry, theories of gas phase reactions, scattering theory, interaction of radiation with matter and time-dependent relaxation methods.
Lecture: 2 **Lab:** 0 **Credits:** 2

CHEM 684
Graduate Seminars in Chemistry
To foster scientific communications skills, students are required to present seminars based on the scientific literature. Required of all Ph.D. students who have passed the written qualifying examination.
Lecture: 1 **Lab:** 0 **Credits:** 1

CHEM 685
Chemistry Colloquium
Lectures by invited scientists in areas of chemistry generally not covered in the department.
Prerequisite(s): CHEM 585 with min. grade of C
Lecture: 0 **Lab:** 1 **Credits:** 1

CHEM 691
Research and Thesis Ph.D.
(Credit: Variable) Instructor permission required.
Credit: Variable

CHEM 700
Practical Laboratory for Analytical Chemistry
In this one-week intensive course, students will gain hands-on experience using analytical instruments. A brief review of theory of instrumentation will be covered. Students will carry out practical problems and will present their findings.
Lecture: 2 **Lab:** 4 **Credits:** 2

SCI 511
Project Management
Successful project management links the basic metrics of schedule adherence, budget adherence, and project quality. But, it also includes the 'people components' of customer satisfaction and effective management of people whether it is leading a project team or successfully building relationships with co-workers. Through course lectures, assigned readings, and case studies, the basic components of leading, defining, planning, organizing, controlling, and closing a project will be discussed. Such topics include project definition, team building, budgeting, scheduling, risk management and control, evaluation, and project closeout.
Lecture: 3 **Lab:** 0 **Credits:** 3

SCI 522
Public Engagement for Scientists
This course presents strategies for scientists to use when engaging a variety of audiences with scientific information. Students will learn to communicate their knowledge through correspondence, formal reports, and presentations. Students will practice document preparation using report appropriate formatting, style, and graphics. Written assignments, discussion questions, and communication exercises will provide students with a better understanding of the relationship between scientists and their audiences whether in the workplace, laboratory, etc.
Lecture: 3 **Lab:** 0 **Credits:** 3

SCI 595
Ethics for the Health Professions
Lectures and discussion relating to ethics relating to the health professions. This course exposes students to current ethical and social issues surrounding health care, including health care provider and patient interactions and institutional considerations using case study examples.
Lecture: 1 **Lab:** 0 **Credits:** 1