

## CHE

## Chemistry

- CHE 101 MOLECULAR SCIENCE FOR CITIZENS. (3)**  
A conceptual introduction to the molecular nature of natural and man-made materials as well as the key molecules of biological organisms. The important classes of molecules will be discussed in terms of their properties and impact on our everyday real world experience.
- CHE 103 CHEMISTRY FOR HEALTH PROFESSIONALS. (4)**  
A study of the basic concepts of general, organic, and biological chemistry. Topics include electronic structure of atoms and molecules, periodicity of the elements, stoichiometry, states of matter, kinetics, equilibria, acids and bases, organic functional groups, stereochemistry, carbohydrates, lipids, proteins, and enzymes. Topics are presented with an emphasis on application to the allied health professions. Prereq: Credit for MA 111, or Math ACT score above 20, or ALEKS Math Placement above 45.
- \*CHE 104 INTRODUCTORY GENERAL CHEMISTRY. (3)**  
A study of general principles, including laws of definite and multiple proportions, stoichiometry, gases, electronic structure, chemical bonding, periodic relationships, oxidation-reduction, chemical equilibrium and acids/ bases. Not open to students who have already completed both CHE 105 and CHE 107. Not recommended for students seeking careers in science, engineering, medicine, pharmacy or dentistry for which the recommended sequence is CHE 105/107. Prereq: Credit for MA 111, or Math ACT score above 20, or ALEKS Math Placement above 45.
- \*CHE 105 GENERAL COLLEGE CHEMISTRY I. (4)**  
A study of chemical principles and their application to pure and mixed substances. Not open to students who have already completed both CHE 109 and CHE 110. Prereq: Math ACT of 23 or above (or Math placement test), or MA 109, or MA 110.
- \*CHE 107 GENERAL COLLEGE CHEMISTRY II. (3)**  
A continuation of CHE 105. A study of the principles of chemistry and their application to elements and compounds. Prereq: CHE 105 or CHE 110 (with a C or better).
- \*CHE 108 INTRODUCTION TO INORGANIC, ORGANIC AND BIOCHEMISTRY WITHOUT LABORATORY. (3)**  
Formally a continuation of CHE 104, a study of selected aspects of inorganic, organic, and biochemistry including the chemistry of metals and nonmetals, basic organic functional groups, proteins, nucleic acids, and lipids. Not recommended for students seeking careers in medicine, pharmacy, science, dentistry, and engineering for which the recommended sequence is CHE 105/107. Prereq: CHE 104 or CHE 105.
- \*CHE 109 GENERAL CHEMISTRY 1A. (4)**  
A study of chemical principles and their applications to pure and mixed substances. The two-semester CHE 109/110 sequence covers the same material as CHE 105. Prereq: Math ACT of 23 or above (or math placement test), or MA 109 or MA 110.
- \*CHE 110 GENERAL CHEMISTRY 1B. (4)**  
A continuation of CHE 109; CHE 109 and 110 are equivalent to CHE 105. Prereq: CHE 109 with grade C or better.
- \*CHE 111 GENERAL CHEMISTRY I LABORATORY. (1)**  
A laboratory course, to accompany CHE 105 or CHE 110, dealing with the properties of chemical substances and providing an introduction to quantitative chemical analysis. Prereq or coreq: CHE 105 or CHE 110.
- \*CHE 113 GENERAL CHEMISTRY II LABORATORY. (2)**  
A laboratory course, to accompany CHE 107, emphasizing qualitative and quantitative chemical analysis. Prereq: CHE 111; prereq or concur: CHE 107.
- CHE 195 GENERAL CHEMISTRY WORKSHOP I. (1)**  
Peer-led team problem solving. Two-hour workshop offered on a pass-fail basis only. Enrollment in CHE 105 need not be accompanied by enrollment in CHE 195. Prereq: Concurrent registration in CHE 105 required.
- CHE 197 GENERAL CHEMISTRY WORKSHOP II. (1)**  
Peer-led team problem solving. Two-hour workshop offered on a pass-fail basis only. Enrollment in CHE 107 need not be accompanied by enrollment in CHE 197. Prereq: Concurrent registration in CHE 107 required.

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- CHE 199 RESEARCH EXPERIENCE IN CHEMISTRY.** (0)  
Participation in laboratory research in chemistry. Offered pass/fail only. Prereq: Permission of instructor.
- CHE 226 ANALYTICAL CHEMISTRY.** (3)  
An introduction to the theory and practice of quantitative chemical analysis. Lecture, 2 hours; laboratory, 3 hours. Prereq: CHE 107 and CHE 113.
- CHE 230 ORGANIC CHEMISTRY I.** (3)  
Fundamental principles and theories of organic chemistry. Prereq: CHE 107 and 113.
- CHE 231 ORGANIC CHEMISTRY LABORATORY I.** (1)  
Laboratory for CHE 230 or CHE 236. Laboratory, three hours per week. Prereq: CHE 113; prereq or concur: CHE 230 or CHE 236.
- CHE 232 ORGANIC CHEMISTRY II.** (3)  
A continuation of CHE 230. Prereq: CHE 230 with grade C or above.
- CHE 233 ORGANIC CHEMISTRY LABORATORY II.** (1)  
Laboratory for CHE 232. Laboratory, three hours per week. Prereq: CHE 231. Prereq or concur: CHE 232.
- CHE 236 SURVEY OF ORGANIC CHEMISTRY.** (3)  
A one-semester course in organic chemistry. Not open to students who have already completed both CHE 230 and 232. Prereq: CHE 107 and 113.
- CHE 250 FORENSIC SCIENCE ON TELEVISION.** (3)  
This course will introduce students to the basic chemical and biochemical principles of forensic science utilized on popular science/science fiction television shows. Forensic science involves the application of techniques from instrumental chemical analysis and molecular biology to identify and quantify evidence collected from crime scenes. By using popular television shows to introduce specific techniques students should gain a basic understanding of the capabilities and limitations of forensic science as it is presently practiced. Prereq: CHE 103 or CHE 104 or CHE 110 or CHE 105.
- CHE 295 ORGANIC CHEMISTRY WORKSHOP I.** (1)  
Peer-led team problem solving. Two-hour workshop offered on a pass-fail basis only. Enrollment in CHE 230 need not be accompanied by enrollment in CHE 295. Prereq: Concurrent registration in CHE 230 required.
- CHE 297 ORGANIC CHEMISTRY WORKSHOP II.** (1)  
Peer-led team problem solving. Two-hour workshop offered on a pass-fail basis only. Enrollment in CHE 232 need not be accompanied by enrollment in CHE 297. Prereq: Concurrent enrollment in CHE 232 required.
- CHE 372 COMMUNICATION IN CHEMISTRY I.** (1)  
Reports and discussions on recent research and current chemical literature; writing and revision of scientific papers; literature searching methods; preparation of effective presentations abstracts and visual aids. CHE 372 and CHE 472 meet the A&S College Writing and Communications Requirement. Prereq: CHE 226 (or concurrent) or CHE 232 (or concurrent) or consent of Director of Undergraduate Studies. This course is a Graduation Composition and Communication Requirement (GCCR) course in certain programs, and hence is not likely to be eligible for automatic transfer credit to UK.
- #CHE 380 TOPICS IN MOLECULAR SCIENCE (Subtitle required).** (2-4)  
Detailed study of a given aspect of molecular science. Topic, prereqs and credit hours are announced the preceding semester. May be repeated to a maximum of six credits when identified by different subtitles. Prereq: Prerequisites will be set by the instructor.
- CHE 395 INDEPENDENT WORK IN CHEMISTRY.** (1-3)  
An independent research project in an area of chemistry under the direction of a chemistry faculty mentor. Must be approved by the Director of Undergraduate Studies in Chemistry. May be repeated to a maximum of 12 credits. Prereq: Declared major in Chemistry; CHE 230, 231; CHE 232 or CHE 226; GPA of at least 3.0 in CHE courses.

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- CHE 410G INORGANIC CHEMISTRY. (2)**  
An overview of inorganic chemistry, including fundamental aspects of structure, bonding, periodicity, spectroscopic properties, reaction mechanisms and applications. Prereq: CHE 231 and 232; prereq or concur: a physical chemistry course at or above the 400 level.
- CHE 412 INORGANIC CHEMISTRY LABORATORY. (2)**  
A laboratory course that will acquaint the student with the synthesis, characterization and properties of inorganic and organometallic compounds of both main-group and transition elements. Laboratory, six hours per week. Prereq: CHE 410G; prereq or concur: a physical chemistry course at or above the 400 level.
- CHE 422 INSTRUMENTAL ANALYSIS. (4)**  
The theory and application of instrumental methods of analysis. Lecture, two hours; laboratory, six hours. Prereq: A physical chemistry course at or above the 400 level.
- CHE 440G INTRODUCTORY PHYSICAL CHEMISTRY. (3)**  
A one-semester survey of thermodynamics, chemical kinetics, and quantum chemistry with an elementary introduction to spectroscopy. Prereq: PHY 213 or PHY 232; MA 114; CHE 226 or MA 213.
- CHE 441 PHYSICAL CHEMISTRY LABORATORY. (2)**  
Laboratory studies in physical chemistry, including quantum chemistry, spectroscopy, thermodynamics and chemical kinetics. Laboratory, six hours. Prereq: A physical chemistry course at or above the 400 level.
- CHE 442G THERMODYNAMICS AND KINETICS. (3)**  
Principles of physical chemistry including thermodynamics, chemical kinetics, and statistical thermodynamics. Prereq: CHE 226; MA 213; PHY 213 or 232.
- CHE 446G PHYSICAL CHEMISTRY FOR ENGINEERS. (3)**  
An introductory course in physical chemistry for engineering students. Kinetic theory, thermodynamics, phase diagrams, colligative properties, electrochemistry, transport properties, kinetics, quantum theory, spectroscopy. Prereq: CHE 107, 113; PHY 232; MA 213; CME 200 or the equivalent.
- CHE 454 BIOLOGICAL CHEMISTRY LABORATORY. (2)**  
An introductory biological chemistry laboratory course. Areas of experimentation will include spectroscopic methods, electrophoresis, chromatography, and isolation and characterization of biological macromolecules. Prereq: CHE 232, or CHE 550 and a physical chemistry course at or above the 400 level (e.g., CHE 440), or consent of instructor.
- CHE 472 COMMUNICATION IN CHEMISTRY II. (1)**  
Reports and discussions on recent research and current chemical literature in seminar format; literature searching methods; résumé construction; preparation of effective presentations abstracts and visual aids. CHE 472 and CHE 372 meet the A&S College Writing and Communications Requirement. Prereq: CHE 372 or consent of the Chemistry Director of Undergraduate Studies. This course is a Graduation Composition and Communication Requirement (GCCR) course in certain programs, and hence is not likely to be eligible for automatic transfer credit to UK.
- CHE 510 ADVANCED INORGANIC CHEMISTRY. (3)**  
A course dealing with the concepts of inorganic chemistry with emphasis on atomic structure, periodicity, nomenclature, bonding, reaction mechanisms and acid-base theories. Prereq: CHE 232, CHE 226, and a physical chemistry course at or above the 400 level; or CHE 410G and CHE 412G.
- CHE 514 DESCRIPTIVE INORGANIC CHEMISTRY. (3)**  
A course dealing in detail with descriptive chemistry of the elements and their compounds, excluding the hydrocarbons and their derivatives. Prereq: CHE 226 and CHE 232; or CHE 450G, or permission of instructor.
- CHE 516 INORGANIC MATERIALS CHEMISTRY. (3)**  
Introduction to solid state inorganic materials chemistry, including atomic structure; optical, electronic, and magnetic properties; and characterization methods such as x-ray diffraction and electron microscopy. Prereq: CHE 440G or CHE 547 or equivalent; and CHE 410G or 510 or equivalent; or permission from the instructor.

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- CHE 520 RADIOCHEMISTRY.** (3)  
Applications of radionuclides in chemistry with emphasis on principles of radioactive decay, interactions of radiation with matter, use of isotopic tracers, activation analysis, isotope dilution analysis, hot atom chemistry and nuclear dating methods. Prereq: CHE 107, or 226.
- CHE 524 CHEMICAL INSTRUMENTATION.** (4)  
Aspects of electronics, microcomputers, computer interfacing, and data analysis as they apply to chemical measurements and measurement systems. Lecture, two hours; laboratory, six hours per week. Prereq: A physical chemistry course at or above the 400 level or consent of instructor.
- CHE 525 BIOANALYTICAL SENSORS.** (3)  
Theory, principles, and applications of bioanalytical sensors and sensing systems, including transducers, molecular recognition, and microfabrication. Prereq: A physical chemistry course at or above the 400 level, or consent of instructor.
- CHE 526 CHEMICAL SEPARATIONS.** (2)  
An advanced study of the theory, instrumentation, and analytical applications of chemical separation methods. Prereq: A physical chemistry course at or above the 400 level, or consent of instructor.
- CHE 532 SPECTROMETRIC IDENTIFICATION OF ORGANIC MOLECULES.** (2)  
A discussion of nuclear magnetic resonance, ultraviolet and infrared spectroscopies, and mass spectrometry in the determination of the structure and stereochemistry of organic molecules. Prereq: CHE 231 and CHE 232.
- CHE 533 ADVANCED ORGANIC CHEMISTRY LABORATORY.** (2)  
The practice of synthesis, purification, and characterization of organic compounds in the modern chemistry laboratory. Laboratory, six hours. Prereq: CHE 532.
- CHE 535 SYNTHETIC ORGANIC CHEMISTRY.** (3)  
A general survey of organic chemistry with emphasis on synthetic methods and the synthesis of natural products. Prereq: CHE 232.
- CHE 536 ORGANIC MATERIALS: ELECTRONIC AND PHOTONIC PROPERTIES.** (3)  
A description of relationships between molecular structure and optical and electronic properties, focusing on changes in properties moving from single molecules to aggregates to bulk solid states. Electronic structure and photonic properties of organic molecules, solid-state polymers and interfaces will be considered. Material characteristics will be studied in the types of devices where organic materials show promising performance: displays, lighting, transistors, energy conversion/storage applications, and non-linear optics technologies. Prereq: CHE 232 and PHY 213 or PHY 232, or permission of the instructor.
- CHE 538 PRINCIPLES OF ORGANIC CHEMISTRY.** (3)  
A general survey of the field of organic chemistry. Topics emphasized are: mechanistic principles relating molecular structure to reaction outcome, stereoisomerism and its effect on chemical reactivity, and simple molecular orbital theory as required to understand aromaticity and to predict the occurrence and stereochemistry of pericyclic reactions. Prereq: CHE 232.
- CHE 547 PRINCIPLES OF PHYSICAL CHEMISTRY I.** (3)  
An introduction to quantum chemistry and spectroscopy, emphasizing modern applications of quantum theory to the calculation of molecular properties. Practical experience with quantum chemistry software on various computer platforms is included. Prereq: MA 213; PHY 213 or 232; or consent of instructor.
- CHE 548 PRINCIPLES OF PHYSICAL CHEMISTRY II.** (3)  
Fundamental principles of classical physical chemistry, including thermodynamics, statistical thermodynamics, and chemical kinetics. Prereq: A physical chemistry course at the 400 level or above, or consent of instructor.
- \*CHE 550 BIOLOGICAL CHEMISTRY I.** (3)  
An introduction to biological chemistry. Topics include amino acids and proteins; nucleic acids and nucleotides; enzyme structure, function and energetics; metabolism including glycolysis; the tricarboxylic acid cycle; electron transport and oxidative phosphorylation; glycogen metabolism; hormone action; and other aspects of modern biological chemistry. Prereq: CHE 232.

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- \*CHE 552 BIOLOGICAL CHEMISTRY II. (3)**  
A further introduction to biological chemistry. Topics include lipid metabolism, biosynthesis and metabolism of nitrogen-containing compounds, storage and utilization of genetic information, immunochemistry, and other contemporary topics in biological chemistry Prereq: CHE 232.
- CHE 553 CHEMISTRY AND MOLECULAR BIOTECHNOLOGY. (3)**  
This course focuses on the chemical aspects of biotechnology development. Current topics in biotechnology are emphasized through extensive reading and classroom discussion of the most recent scientific literature. Biotechnology development in fields as diverse as agriculture, the environment, and medicine will be covered. Prereq: An introductory course in biology, biological chemistry, or biochemistry; and CHE 232; or consent of instructor.
- CHE 555 HOMONUCLEAR NMR. (3)**  
This course will give students hands-on experience with modern NMR experiments that are the mainstays of chemical structural analysis and biophysical studies of macromolecules and pharmaceuticals. Lecture, two hours; laboratory, three hours per week. Prereq: CHE 232 or 236; and a physical chemistry course at or above the 400 level.
- CHE 556 ELEMENTS OF NEUROCHEMISTRY. (3)**  
A course in the neurochemistry of the brain. Among topics to be covered: brain cell cytoarchitecture; chemical bases for: neuronal membrane transport, electrical excitability, and ion channels; axonal transport; energy metabolism; synaptic transmission; cellular signaling; Ca<sup>2+</sup> homeostasis; neurotransmitters; oxidative stress; apoptosis and necrosis; application of neurochemical principles to the molecular bases of neurodegenerative disorders. Prereq: CHE 232 and a biological chemistry course, or consent of instructor.
- CHE 558 HORMONE RECEPTORS AND CELL SIGNALS. (3)**  
This course starts with the general concepts on hormones and their receptors and describes how hormones interact with their receptors and generate hormone signals and responses. Prereq: BIO 315 or equivalent, BCH 401G or equivalent, CHE 550 or 552 or equivalent, or consent of instructor.
- CHE 559 MOLECULAR BIOPHYSICS. (3)**  
Overview of intermolecular forces responsible for formulation tertiary structure and macromolecular assemblies, as well as linked equilibria, allostery and propagation of signals. Extension of these principles to explain macromolecular machines, complex molecular behavior and, ultimately, processes of life. Prereq: A physical chemistry course at the 400 level or above, or consent of instructor.
- CHE 565 ENVIRONMENTAL CHEMISTRY. (3)**  
A study of the sources, reactions, transport, effects, and fates of chemical species in the atmosphere, hydrosphere, lithosphere and biosphere. Prereq: Two semesters of general college chemistry are required. Courses in analytical and physical chemistry are recommended, but are not required.
- CHE 566 ORGANIC MATERIALS: CHARACTERIZATION AND DEVICES. (3)**  
A study of applications of organic materials in electronic and optical devices, focusing on appropriate material-selection, processing, and interpretation of device output. Will cover basic methods for the formation of thin films of organic molecules and polymers, various spectroscopic techniques relevant to device performance, and methods to form and measure devices such as transistors and light-emitting diodes. Hybrid organic-inorganic material systems, and complex device structures for all-organic circuitry will be discussed. Prereq: CHE 232 and PHY 213 or PHY 232, or permission of the instructor.
- CHE 567 ORGANIC MATERIALS: FABRICATION LABORATORY. (2)**  
A laboratory course focused on the fabrication and characterization of organic and organic-inorganic hybrid electronic devices. Although a stand-alone course, the laboratory will cover practical aspects related to topics covered in CHE 536 and 566, including processing methods and characterization of optical and electronic properties of organic materials and thin films. Prereq: CHE 536 or CHE 566, and PHY 213 or 232, or permission of the instructor,
- CHE 576 POLYMER CHEMISTRY. (3)**  
Introduction to the theory and practice of polymer chemistry and polymer characterization. Prereq: CHE 230 and CHE 226; or permission from the instructor.

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**CHE 580 TOPICS IN CHEMISTRY.****(1-3)**

A detailed investigation of a topic of current significance in chemistry. May be repeated to a maximum of six credits. Lecture and/or laboratory: variable. Prereq: CHE 232 and a physical chemistry course at the 400 level or above, or consent of instructor.

**CHE 610 CHEMISTRY OF THE TRANSITION METALS.****(3)**

A detailed treatment of the chemistry of the transition elements, lanthanides and actinides, including the structure of coordination complexes, bonding, reaction mechanisms and preparations. Prereq: CHE 510.

**CHE 612 INORGANIC CHEMISTRY OF THE NON-METALS.****(3)**

A detailed treatment of the inorganic chemistry of the nonmetals. Topics include theories of bonding, spectral characteristics, reaction mechanisms, preparations, physical methods of characterization and structural determination, and applications. Prereq: CHE 510.

**CHE 614 ORGANOTRANSITION METAL CHEMISTRY.****(3)**

A detailed treatment of the organometallic chemistry of the transition metals, including lanthanides and actinides. Topics include synthesis, structure, bonding theories, reactions, characterization by physical methods, and applications in organic chemistry and catalysis. Prereq: CHE 232, and CHE 410G or 510, and a physical chemistry course at the 400 level or above, or consent of instructor.

**CHE 620 ELECTROCHEMICAL METHODS OF ANALYSIS.****(3)**

An intensive study of the fundamental theories and principles of electrochemistry, and their practical applications for physical and quantitative analytical measurements. Topics include potentiometric, voltammetric, amperometric, and coulometric methods. Prereq: CHE 522 or a physical chemistry course at the 400 level or above.

**CHE 623 CHEMICAL EQUILIBRIUM AND DATA ANALYSIS.****(3)**

An advanced treatment of chemical equilibrium, sampling, and the evaluation of data obtained from chemically related measurements. Prereq: CHE 226 or 522 or a physical chemistry course at the 400 level or above.

**CHE 625 SPECTROCHEMICAL ANALYSIS.****(3)**

An intensive study of the theory, instrumentation, and analytical applications of modern atomic and molecular spectrometric methods. Prereq: CHE 522.

**CHE 626 ADVANCED ANALYTICAL CHEMISTRY.****(3)**

An advanced study of the theory and practice of quantitative analysis.

**CHE 640 CHEMICAL CRYSTALLOGRAPHY.****(3)**

An introduction to modern small-molecule crystallography with emphasis on typical applications of interest to synthetic chemists. Prereq: CHE 232 and a physical chemistry course at the 400-level or above.

**CHE 643 SPECTROSCOPY AND PHOTOPHYSICS.****(3)**

An integrated treatment of modern spectroscopy and photophysics. Topics to include atomic spectroscopy, microwave, infrared and UV-visible spectroscopy of diatomic and polyatomic molecules, lasers, creation and detection of excited states, fluorescence, phosphorescence, radiationless processes and photochemical transformations. Prereq: CHE 547 or 446G or permission of instructor.

**CHE 646 CHEMICAL KINETICS.****(3)**

Studies of chemical reactions from the standpoint of velocity and mechanism. Prereq: CHE 442G.

**CHE 664 MULTIDISCIPLINARY SENSORS LABORATORY.****(3)**

A multidisciplinary laboratory course with laboratory experiences in areas related to sensors and sensing architectures, typically including chemistry, chemical and materials engineering, and electrical engineering. Lecture, 1 hour; laboratory, 2 hours. Prereq: One year of college chemistry, calculus and physics. GS 660 or by consent of instructor. (Same as CME/EE/MSE 664.)

**CHE 666 PROTEOMICS AND MASS SPECTROMETRY.****(3)**

A course in the identification, characterization, and quantification of the proteins in tissues and cells. Mass spectrometric methods are of central importance, and those techniques (including data analysis) are a major focus of the course. Prereq: CHE 232, a course in physical chemistry at or above the 400-level.

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- CHE 668 SYMMETRY AND CHEMICAL APPLICATIONS. (3)**  
An integrated treatment of fundamentals, techniques, and chemical applications of molecular symmetry and group theory. Prereq: A physical chemistry course at the 400-level, or consent of instructor.
- CHE 736 TOPICS IN ORGANIC CHEMISTRY. (2-4)**  
Selected topics which may include heterocyclic organic compounds, natural and synthetic dyes, carbohydrates, nitrogen compounds, and recent advances in the field of organic chemistry. May be repeated to a maximum of 12 credits.
- CHE 746 TOPICS IN PHYSICAL CHEMISTRY. (2-4)**  
Selected topics which may include photochemistry, structure of crystals, molecular spectra, nature of the chemical bond, and other recent advances in the field of physical chemistry. May be repeated to a maximum of 12 credits. Prereq: A physical chemistry course at the 400 level or above.
- CHE 748 MASTER'S THESIS RESEARCH. (0)**  
Half-time to full-time work on thesis. May be repeated to a maximum of six semesters. Prereq: All course work toward the degree must be completed.
- CHE 749 DISSERTATION RESEARCH. (0)**  
Half-time to full-time work on dissertation. May be repeated to a maximum of six semesters. Prereq: Registration for two full-time semesters of 769 residence credit following the successful completion of the qualifying exams.
- CHE 767 DISSERTATION RESIDENCY CREDIT. (2)**  
Residency credit for dissertation research after the qualifying examination. Students may register for this course in the semester of the qualifying examination. A minimum of two semesters are required as well as continuous enrollment (Fall and Spring) until the dissertation is completed and defended.
- CHE 768 RESIDENCE CREDIT FOR MASTER'S DEGREE. (1-6)**  
May be repeated to a maximum of 12 hours.
- CHE 769 RESIDENCE CREDIT FOR DOCTOR'S DEGREE. (0-12)**  
May be repeated indefinitely.
- CHE 772 SEMINAR IN CHEMISTRY INSTRUCTION. (1)**  
A seminar for teaching assistants on the methods and techniques of effective instruction in laboratory and recitation classes in chemistry. Required of all new graduate teaching assistants. Prereq: Admission to M.S. or Ph.D. program in chemistry.
- \*CHE 776 GRADUATE SEMINAR. (3)**  
Reports and discussions on recent research and current literature. Required of all graduate students. Prereq: Graduate Standing.
- CHE 779 MEMBRANE SCIENCES COLLOQUIUM. (1)**  
Outstanding membrane scientists present their current research on biological and/or synthetic membranes. Students read a pertinent paper by the speaker prior to his/her talk and write a short paper on the talk; especially important is relevance of the main points of the talk to membrane science in general and the student's own research in particular. May be repeated to a maximum of six credits. (Same as BCH/CME/PHA/PHR 779.)
- CHE 780 INDIVIDUAL WORK IN CHEMISTRY. (1-5)**  
Selected library and laboratory problems in conformance with the student's interest will be attacked and pursued under the direction of a suitable staff member who is proficient in the area under investigation.
- CHE 790 RESEARCH IN CHEMISTRY. (1-12)**  
Work may be taken in the following fields, subject to the approval of the Departmental Graduate Committee: analytical chemistry, industrial chemistry, inorganic chemistry, organic chemistry, radiochemistry, or physical chemistry. May be repeated indefinitely.