

CH-Chemistry

CH 525. Physical Chemistry I for Graduate Study. 3 Hours.

Thermodynamics and chemical equilibria; and chemical kinetics.
Prerequisites: Calculus II, College Physics II and General Chemistry II.

CH 526. Physical Chemistry II for Graduate Study. 3 Hours.

Quantum mechanics, chemical bonding, and molecular spectroscopy.
Prerequisites: Calculus II, College Physics II and General Chemistry II.

CH 535. Organic Chemistry I for Graduate Study. 3 Hours.

Structure, nomenclature, properties, and reactivity of compounds with various organic functional groups: alkanes, alkenes, alkynes, alkyl halides and alcohols. Emphasis on the mechanisms of organic reactions and problem solving. Prerequisite: General Chemistry II.

CH 537. Organic Chemistry II for Graduate Study. 3 Hours.

Reactions of aromatic compounds and carbonyl containing functional groups: aldehydes, ketones, acids, esters and amides. Molecules of biological interest, such as proteins and carbohydrates. Prerequisite: Organic Chemistry I.

CH 540. Inorganic Chemistry I for Graduate Study. 3 Hours.

Chemical reactivity and descriptive chemistry in terms of structural and electronic parameters. Prerequisites: Organic Chemistry II and Organic Chemistry II laboratory with a grade of C or better.

CH 541. Transition Metal Chemistry. 3 Hours.

Atomic structure, chemical bonding characterization and reactivity of transition metal complexes. Prerequisites: Inorganic Chemistry and Physical Chemistry II.

CH 550. Instrumental Analysis for Graduate Study. 3 Hours.

Focus on modern analytical chemistry instrumentation including chemical separations, spectroscopies (atomic absorption, infrared, UV-visible, fluorescence), nuclear magnetic resonance spectroscopy, mass spectroscopy, and thermal analysis. Concurrent enrollment in CH 550L Instrumental Analysis Laboratory is recommended. Prerequisites: Quantitative Analysis Techniques.

CH 550L. Instrumental Analysis Laboratory for Graduate Study. 0 Hours.

Instrumental Analysis Laboratory. Concurrent enrollment in CH 550 Instrumental Analysis for Graduate Study required.

CH 555. Quantitative Analysis for Graduate Study. 4 Hours.

Principles of analytical measurements, gravimetric analysis, spectrophotometric analysis, and chromatography, with emphasis on equilibrium and applications. Lecture and laboratory. Concurrent enrollment in CH 555L Quantitative Analysis Lab required. Prerequisite: General Chemistry II.

Prerequisites: CH 550 [Min Grade: C]

CH 555L. Quantitative Analysis I for Graduate Study Lab. 0 Hours.

Emphasizing quantitative analysis laboratory. Concurrent enrollment in CH 555 Quantitative Analysis required.

CH 560. Fundamentals of Biochemistry. 3 Hours.

Overview of biochemical principles; chemistry of aqueous solutions, biochemical building blocks including amino acids, carbohydrates, lipids, and nucleotides; structure and function of proteins, membranes and nucleic acids; enzyme kinetics. Catabolic and anabolic metabolism in biomolecules, regulation of metabolic processes.

Prerequisites: CH 237 [Min Grade: C] or CH 247 [Min Grade: C]

CH 561. Advanced Biochemistry I. 3 Hours.

Advanced study of protein structure and function, enzymology, DNA structure, prokaryotic replication, transcription, and protein synthesis. Membrane structure and function, carbohydrate structure and function. Methods for isolating and characterizing macromolecule structure and function including chromatography, gel electrophoresis, CD, UV, and fluorescence spectroscopy, mass spectroscopy, X-ray crystallography and nuclear magnetic resonance spectroscopy.

Prerequisites: CH 560 [Min Grade: C]

CH 562. Advanced Biochemistry II. 3 Hours.

Continuation of Advanced Biochemistry I focusing on eukaryotic replication, transcription, translation, regulation of gene expression, genomics, proteomics, biological signaling. Prerequisites: Successful completion of CHEM 561.

Prerequisites: CH 561 [Min Grade: C]

CH 563. Biochemistry Laboratory. 3 Hours.

Introduction to modern bioanalytical techniques used for the expression, isolation and characterization of proteins and other biological macromolecules. Prerequisites: Quantitative Analysis and Biochemistry and permission of instructor.

CH 564. Physical Biochemistry Laboratory. 3 Hours.

Physical/analytical approaches (including mass spectroscopy and NMR) toward determination of macromolecular structures, ligand binding, and enzymology. Prerequisites: Background in physical chemistry I and II, quantitative analysis, and biochemistry. Permission of instructor required.

Prerequisites: CH 325 [Min Grade: C] and CH 355 [Min Grade: C] and CH 461 [Min Grade: C]

CH 565. Structural Biochemistry. 3 Hours.

Principles of macromolecular structure, emphasizing proteins, nucleic acids, and macromolecular assemblies. Computational methods used to teach principles and modeling software used for construction of computer models of proteins and nucleic acids. Lecture and computer Laboratory.

CH 571. Medicinal Chemistry & Drug Discovery. 3 Hours.

An advanced organic course with emphasis on design strategies for discovering small organic molecule drugs using common macromolecular drug targets. Examples of successful design for clinically used drug classes will be presented.

CH 573. Electron Pushing and Total Synthesis. 3 Hours.

The advanced organic course is aimed to enhance students' comprehension of advanced organic chemistry theory and principles, and apply them to understand reaction mechanisms and tactic of total synthesis. It will cover different types of common organic reactions each week, for example, reactions involving anion intermediates, cation intermediates, rearrangement, photochemical process, carbonyl compounds, and other reactive intermediates. Using electron pushing for mechanistic reasoning will be emphasized.

CH 574. X-Ray Crystallography. 3 Hours.

Fundamental principles of X-ray crystallography. Students gain enough information to be able to collect meaningful data and analyze and refine structures. Students learn how to collect, process and analyze x-ray data, focus on heavy atom phasing techniques and use state of the art software for refinement. Permission of instructor.

CH 580. Polymer Chemistry I. 3 Hours.

Basic chemical principles of polymers with the focus on synthesis, characterization, and applications of synthetic and biological macromolecules. Includes laboratory. Prerequisites: undergraduate organic chemistry and permission of instructor. Concurrent enrollment in CH 580 is recommended.

CH 580L. Polymer Chemistry I for Graduate Study Laboratory. 1 Hour.

Polymer Chemistry I Laboratory.

CH 581. Polymer Chemistry II. 3 Hours.

Fundamentals of chemical, physical, and molecular aspects of polymers in bulk and solutions. Prerequisites: undergraduate organic chemistry and permission of instructor. Concurrent enrollment in CH 581L is recommended.

Prerequisites: CH 580 [Min Grade: C]

CH 581L. Polymer Chemistry II Laboratory. 1 Hour.

Laboratory to accompany CH 581 (Polymer Chemistry II). Concurrent enrollment in CH 581 is recommended.

CH 583. Chemistry of Polymers and Polymeric Materials I. 3 Hours.

Basic chemical principles of polymers with the focus on synthesis, characterization, and applications of synthetic and biological macromolecules. No laboratory is required. This course sequence is for BME or Material Science Graduate Students. The laboratory accompanying Polymer Chemistry I is NOT required for these students.

CH 584. Chemistry of Polymers and Polymeric Materials II. 3 Hours.

Fundamentals of chemical, physical and molecular aspects of polymers in bulk and solutions. No laboratory is required. The laboratory accompanying Polymer Chemistry II is NOT required.

CH 602. Principles of Chemical Instruction. 3 Hours.

Responsibilities of laboratory instructors, safety regulations, grading, teaching styles and formats, and instructional objectives.

CH 609. Chemical Safety. 3 Hours.

Principles involved in the potential hazards of storing, using, and disposal of chemicals for chemical educators.

CH 610. Laboratory Experiences in Chemistry. 3 Hours.

Application of chemical experiments to high school science programs. Experiments and emphasis may change depending on instructor. Course may be repeated for credit.

CH 611. Atomic Structure and Periodicity for the 7-12 Classroom. 3 Hours.

Exploration of the historical development of atomic structure. Developing instructional strategies to analyze and predict patterns from atomic structure.

CH 612. Valence Electrons and Bonding Models for the 7-12 Classroom. 3 Hours.

Describes how to use the periodic table as a systematic representation to predict and explain physical properties. Explores ionic and covalent bonding models. Predicts molecular shapes and investigates how these predictions are related to macroscopic properties.

CH 613. Introductory Organic Chemistry for Teachers. 3 Hours.

A laboratory, lecture, demonstration course on the nature of carbon compounds including hydrocarbons, functional groups and their reactions. Emphasis given to laboratory experiments and demonstrations suitable for high school students.

CH 614. Introductory Biochemistry for Teachers. 3 Hours.

Lecture series covering carbohydrates, lipids, and proteins. Emphasis given to practical applications and relationship between chemistry and biology.

CH 615. Chemical Reactions and the Conservation of Mass for the 7-12 Classroom. 3 Hours.

Exploration of the types of intensive and extensive properties that allow scientists to identify a compound. Common chemical reaction types will be investigated, and activities showing how chemists use chemical equations to analyze and interpret reaction outcomes will be included. Exploration of the mathematical description of grams, moles, molecules, and atoms are presented. Solution concentration and the use of solutions in chemical reactions will also be investigated. Simple acid-base phenomena will be studied.

CH 616. Gases and the Kinetic Molecular Theory for the 7-12 Classroom. 3 Hours.

An exploration into the molecular level view of gases and how changes in pressure, temperature, and volume of a gas affect the particles of a gas. The mathematical relationships between these properties will be investigated. Applications of the Ideal Gas Law to real-world problems will be explored.

CH 617. Dynamic Equilibria for the 7-12 Classroom. 3 Hours.

The study of dynamic equilibria including the application of LeChatelier's Principle. Practical applications of LeChatelier's Principle and calculations related to the effects of these macroscopic changes on solution concentrations. Classroom investigations into gas phase, acid-base, and solubility equilibria will be included.

CH 619. Special Topics in Chemical Education. 3 Hours.

Topics determined by interest of students and faculty.

CH 625. Molecular Structure and Spectroscopy. 3 Hours.

Classical and quantum mechanical descriptions of molecular structure and bonding. Basic principles and techniques of molecular spectroscopic methods. Exercises and experiments with computational software and spectroscopic instrumentation will be conducted.

CH 629. Special Topics in Physical Chemistry. 3 Hours.

Topics determined by interest of students and faculty. Typical are computational chemistry, molecular spectroscopy, nuclear magnetic resonance. Topics determined by interest of students and faculty.

Prerequisites: CH 600 [Min Grade: C]

CH 630. Physical Organic Chemistry. 3 Hours.

Localized and delocalized chemical bonds, stereochemistry, acidity and basicity, determining organic mechanisms and structure. Fall.

CH 631. Organic Reactions and Their Mechanisms. 3 Hours.

Nucleophilic and electrophilic substitution, free radical substitutions, additions to carbon-carbon and carbon-hetero multiple bonds, elimination reactions. Prerequisite: Spring.

Prerequisites: CH 630 [Min Grade: C]

CH 632. Organic Reactions and Synthesis. 3 Hours.

Strategy of synthesis, carbon skeletal assembly, selective functional group interconversion, blocking groups, stereochemical control. Spring.

Prerequisites: CH 631 [Min Grade: C]

CH 633. Reactive Intermediates and Conservation of Bonding. 3 Hours.

Behavior of organic molecules in static and reactive situations. Spring.

Prerequisites: CH 631 [Min Grade: C]

CH 639. Special Topics in Organic Chemistry. 1-3 Hour.

Topics determined by interest of students and faculty.

Prerequisites: CH 327 [Min Grade: C]

CH 640. Bonding and Structure in Inorganic Compounds. 3 Hours.

Advanced treatment of bonding in main group and transition metal compounds, and a study of its relationship properties of compounds. Spring.

Prerequisites: CH 540 [Min Grade: C]

CH 642. Organometallic Chemistry and Catalysis. 3 Hours.

Study of transition metal organometallic compounds and their applications as homogeneous catalysts for organic and polymer syntheses. Summer (alternate years).

Prerequisites: CH 640 [Min Grade: C] or CH 740 [Min Grade: C]

CH 649. Special Topics in Inorganic Chemistry. 1-3 Hour.

Topics determined by interest of students and faculty.

CH 651. Chemometrics. 3 Hours.

Introduction to basic data analysis techniques that include testing hypotheses, establishing tendencies and correlations, experimental design, etc. This course is designed to provide a support to a research chemist in effectively solving everyday problems associated with production and interpretation of experimental data.

CH 652. Analytical Spectroscopy. 3 Hours.

Instrumentation and methodology used in modern analytical spectrometry. Emphasis and examples taken primarily from vibrational spectroscopy (infrared and Raman), however, principles are applicable to many types of spectrometric measurements. Physical theory, optical principles, experimental methodology, instrument design, and numerical data processing are covered.

CH 654. Multivariate Analysis in Analytical Chemistry. 3 Hours.

Theoretical and practical concepts of multivariate statistical methods applied to data obtained from analytical measurements, including advanced data analysis in experimental spectroscopy. Systematic evaluation of high-dimensional data sets through multivariate means of calibration and classification. The course is intended for graduate students in chemistry, or related fields such as the physical or biochemical sciences, or engineering, who wish to understand the application of informatics methods and numerical analysis techniques to complex data sets.

CH 656. Analytical Separations. 3 Hours.

Advanced treatment of distillation, extraction, gas chromatography, HPLC, TLC, and GC-MS.

Prerequisites: CH 551 [Min Grade: C]

CH 659. Special Topics in Analytical Chemistry. 3 Hours.

Introduction to thermally initiated physical and chemical processes in the condensed phase systems such as liquids, crystalline solids, and glasses (amorphous solids). The course covers the use of calorimetry, thermogravimetry, and thermomechanical methods for exploring thermodynamics and kinetics of crystallization, glass transition, solid-solid and helix-coil transitions, decomposition, polymerization, etc.

CH 660. Fundamentals of Biochemistry. 3 Hours.

Overview of biochemical principles; chemistry of aqueous solutions, biochemical building blocks including amino acids, carbohydrates, lipids, and nucleotides; structure and function of proteins, membranes and nucleic acids; enzyme kinetics. Catabolic and anabolic metabolism in biomolecules, regulation of metabolic processes.

CH 661. Biochemistry II. 3 Hours.

Biochemistry II: Structure and function of proteins, membranes, membrane proteins, and nucleic acids. Ligand binding and enzyme kinetics. Molecular genetics (replication, transcription, translation) and the control of gene expression and protein synthesis.

CH 663. Biochemistry Laboratory. 3 Hours.

Introduction to modern analytical techniques used for the isolation and characterization of biological macromolecules.

CH 664. Biophysical Chemistry. 3 Hours.

Common physical methods for understanding the structure and stability of macromolecules that include several spectroscopic, thermodynamic and computational methods. Underlying physical principle described, instrumentation discussed, and examples cited from the literature. Spring.

Prerequisites: CH 323 [Min Grade: C]

CH 665. Structural Biochemistry. 3 Hours.

Principles of macromolecular structure, emphasizing proteins, nucleic acids, and macromolecular assemblies. Computational methods used to teach principles and modeling software used for construction of computer models of proteins and nucleic acids. Lecture and computer Laboratory.

CH 669. Special Topics in Biochemistry. 3 Hours.

Detailed consideration of areas of special interest.

Prerequisites: CH 462 [Min Grade: C]

CH 670. Chemical Literature. 3 Hours.

Use of on-line literature and development of searching techniques.

CH 671. Medicinal Chemistry and Drug Discovery. 3 Hours.

Description. Emphasis on design strategies for small organic drugs using common macromolecular drug targets. Examples of successful design for clinically used drug classes will be presented. Prerequisites include undergraduate organic chemistry (CH235 and CH237) and undergraduate biochemistry (CH461) or equivalent. 999999.

Prerequisites: CH 325 [Min Grade: C] and CH 237 [Min Grade: C] and CH 461 [Min Grade: C]

CH 672. Chemistry of Natural Products. 3 Hours.

The principal focus of this course will be the introduction of synthesis and medicinal chemistry of natural products. Drugs discovery using natural products, with specific examples in the areas of antibacterials, anticancer, and analgesic drugs will be introduced. An overview of structural classes, biosynthetic pathways and application of asymmetric synthesis in the synthesis of specific examples from each class will be discussed. This course is intended for undergraduate students at the senior level.

CH 673. Electron Pushing and Total Synthesis. 3 Hours.

The advanced organic course is aimed to enhance students' comprehension of advanced organic chemistry theory and principles, and apply them to understand reaction mechanisms and tactic of total synthesis. It will cover different types of common organic reactions each week, for example, reactions involving anion intermediates, cation intermediates, rearrangement, photochemical process, carbonyl compounds, and other reactive intermediates. Using electron pushing for mechanistic reasoning will be emphasized.

CH 674. X-Ray Crystallography. 3 Hours.

Fundamental principles of X-ray crystallography. Students gain enough information to be able to collect meaningful data and analyze and refine structures. Students learn how to collect, process and analyze x-ray data, focus on heavy atom phasing techniques and use state of the art software for refinement. Permission of instructor.

CH 677. Fundamentals of Radiochemistry. 3 Hours.

This course is intended to act as an introduction to radiochemistry. It will cover production, instrumentation, and radiochemistry techniques to make use of radiotracers in the life sciences from basic biological and environmental applications to medical imaging and therapy.

CH 680. Polymer Chemistry I. 3 Hours.

Basic chemical principles of polymers with the focus on synthesis, characterization, and applications of synthetic and biological macromolecules. Includes laboratory. Prerequisites: undergraduate organic chemistry and permission of instructor. Concurrent enrollment in CH 580L is recommended.

CH 680L. Polymer Chemistry I Laboratory. 1 Hour.

Polymer Chemistry I Laboratory. Recommended with CH 680 lecture.

CH 681. Polymer Chemistry II. 3 Hours.

Fundamentals of chemical, physical, and molecular aspects of polymers in bulk and solutions. Prerequisites: undergraduate organic chemistry and permission of instructor. Concurrent enrollment in CH 680L is recommended.

Prerequisites: CH 680 [Min Grade: C]

CH 681L. Polymer Chemistry II Laboratory. 1 Hour.

Laboratory to accompany CH 681 (Polymer Chemistry II). Concurrent enrollment in CH 681 is recommended.

CH 683. Chemistry of Polymers and Polymeric Materials I. 3 Hours.

Basic chemical principles of polymers with the focus on synthesis, characterization, and applications of synthetic and biological macromolecules. No laboratory is required. This course sequence is for BME or Material Science Graduate Students. The laboratory accompanying Polymer Chemistry I is NOT required for these students.

CH 684. Polymer Chemistry II. 3 Hours.

Fundamentals of chemical, physical and molecular aspects of polymers in bulk and solutions. No laboratory is required. This course sequence is for BME or Material Science Graduate Students. The laboratory accompanying Polymer Chemistry II is NOT required for these students.

CH 689. Special Topics in Polymer Chemistry. 3 Hours.

Detailed consideration of areas of special interests in polymer chemistry.

Prerequisites: CH 580 [Min Grade: C] and CH 581 [Min Grade: C]

CH 691. Seminar. 1 Hour.

Seminars on current topics in chemical research.

CH 692. Seminar Presentation. 2 Hours.

Seminar given by graduate students on current topics in chemical research.

CH 698. Graduate Research. 1-12 Hour.

Prerequisite: Permission of graduate faculty member. Research hours.

CH 699. Thesis Research. 1-12 Hour.

Prerequisites: Admission to candidacy and permission of graduate faculty member. Must have approved 3 member committee and approved candidacy by the graduate dean before registering for 699.

Prerequisites: GAC M

CH 702. Principles of Chemical Instruction. 1 Hour.

Responsibilities of laboratory instructors, safety regulations, grading, teaching styles and formats, and instructional objectives. Prerequisite: Permission of instructor. Fall.

CH 715. Introductory Biochemistry for Teachers II. 3 Hours.

Lecture series covering vitamins, minerals, enzymes, biochemical energy and metabolism. Strong connections between chemistry and biology. Practical applications are emphasized.

CH 725. Molecular Structure and Spectroscopy. 3 Hours.

Classical and quantum mechanical descriptions of molecular structure and bonding. Basic principles and techniques of molecular spectroscopic methods. Exercises and experiments with computational software and spectroscopic instrumentation will be conducted.

CH 729. Special Topics in Physical Chemistry. 3 Hours.

Topics determined by mutual student-faculty interest. Typical are computational chemistry, molecular spectroscopy, nuclear magnetic resonance.

Prerequisites: CH 700 [Min Grade: C]

CH 730. Physical Organic Chemistry. 3 Hours.

Localized and delocalized chemical bonds, stereochemistry, acidity and basicity, determining organic mechanisms and structure. Fall.

CH 731. Organic Reaction and Their Mechanisms. 3 Hours.

Nucleophilic and electrophilic substitution, free radical substitutions, additions to carbon-carbon and carbon-hetero multiple bonds, elimination reactions. Spring.

CH 732. Organic Reaction and Synthesis. 3 Hours.

Strategy of synthesis, carbon skeletal assembly, selective functional group interconversion, blocking groups, stereochemical control. Spring.

Prerequisites: CH 731 [Min Grade: C]

CH 733. Reactive Intermediates and Conservation of Bonding. 3 Hours.

Behavior of organic molecules in static and reactive situations. Spring.

Prerequisites: CH 731 [Min Grade: C]

CH 739. Special Topics in Organic Chemistry. 3 Hours.

Topics determined by interest of students and faculty.

CH 740. Bonding and Structure in Inorganic Compounds. 3 Hours.

Advanced treatment of bonding in main group and transition metal compounds, and a study of its relationship to the properties of compounds. Spring.

Prerequisites: CH 540 [Min Grade: C]

CH 742. Organometallic Chemistry and Catalysis. 3 Hours.

Study of transition metal organometallic compounds and their applications as homogeneous catalysts for organic and polymer syntheses. Summer (alternate years).

Prerequisites: CH 640 [Min Grade: C] or CH 740 [Min Grade: C]

CH 744. Inorganic Structure and Spectroscopy. 3 Hours.

This course will cover fundamental principles of inorganic structure and spectroscopy. Lecture topics will focus on major principles and theories governing inorganic structure of chemical compounds, and discussion of related physical analytical methods. Undergraduate inorganic chemistry is strongly recommended as a prerequisite.

CH 745. Fundamentals in Inorganic Chemistry. 3 Hours.

Fundamental concepts of inorganic chemistry, including electronic configuration, bonding theory, solid-state chemistry, reactivity, and catalysis.

CH 747. Fundamentals and Applications of Actinide Chemistry. 3 Hours.

Fundamentals and Application of Actinide Chemistry is intended to act as an introduction to 5f elements and their applications. Topics will include the chemistry of the actinide elements, radiochemistry of the nuclear fuel cycle, environmental actinide chemistry, nuclear forensics, and related areas. By the end of the semester, you should have a strong foundation in these areas, allowing you to pursue research in a number of related fields.

CH 749. Special Topics in Inorganic Chemistry. 1-3 Hour.

Topics determined by interest of students and faculty.

CH 751. Chemometrics. 3 Hours.

Introduction to basic data analysis techniques that include testing hypotheses, establishing tendencies and correlations, experimental design, etc. This course is designed to provide a support to a research chemist in effectively solving everyday problems associated with production and interpretation of experimental data.

CH 752. Analytical Spectroscopy. 3 Hours.

Instrumentation and methodology used in modern analytical spectrometry. Emphasis and examples taken primarily from vibrational spectroscopy (infrared and Raman), however, principles are applicable to many types of spectrometric measurements. Physical theory, optical principles, experimental methodology, instrument design, and numerical data processing are covered.

CH 754. Multivariate Analysis in Analytical Chemistry. 3 Hours.

Theoretical and practical concepts of multivariate statistical methods applied to data obtained from analytical measurements, including advanced data analysis in experimental spectroscopy. Systematic evaluation of high-dimensional data sets through multivariate means of calibration and classification. The course is intended for graduate students in chemistry, or related fields such as the physical or biochemical sciences, or engineering, who wish to understand the application of informatics methods and numerical analysis techniques to complex data sets.

CH 759. Special Topics in Analytical Chemistry. 3 Hours.

Topics of interest to faculty and students.

CH 760. Fundamentals of Biochemistry. 3 Hours.

Overview of biochemical principles; chemistry of aqueous solutions, biochemical building blocks including amino acids, carbohydrates, lipids, and nucleotides; structure and function of proteins, membranes and nucleic acids; enzyme kinetics. Catabolic and anabolic metabolism in biomolecules, regulation of metabolic processes.

CH 761. Biochemistry II. 3 Hours.

Biochemistry II: Structure and function of proteins, membranes, membrane proteins, and nucleic acids. Ligand binding and enzyme kinetics. Molecular genetics (replication, transcription, translation) and the control of gene expression and protein synthesis.

CH 763. Biochemistry Laboratory. 3 Hours.

Introduction to modern analytical techniques used for the isolation and characterization of biological macromolecules.

CH 764. Biophysical Chemistry. 3 Hours.

Common physical methods for understanding the structure and stability of macromolecules that include several spectroscopic, thermodynamic, and computational methods. Underlying physical principle described, instrumentation discussed, and examples cited from the literature. Spring.

Prerequisites: CH 325 [Min Grade: C]

CH 765. Structural Biochemistry. 3 Hours.

Principles of macromolecular structure, emphasizing proteins, nucleic acids, and macromolecular assemblies. Computational methods used to teach principles and modeling software used for construction of computer models of proteins and nucleic acids. Lecture and computer Laboratory.

CH 767. Advanced Biomolecular NMR spectroscopy: From Quantum Mechanics to Protein Dynamics. 3 Hours.

This course is designed for graduate students who use NMR as a major tool to study structure and dynamics of biomolecules. It covers quantum mechanics explanation of NMR, pulse programming, non-uniform sample, data processing, NMR dynamics at different time scales.

CH 768. Chemistry Journal Club. 1 Hour.

Weekly journal literature seminar and discussion group for chemistry graduate students.

CH 769. Special Topics in Biochemistry. 1-3 Hour.

Detailed consideration of areas of special interest.

CH 770. Chemical Literature. 3 Hours.

Use of on-line literature and development of searching techniques.

CH 771. Medicinal Chemistry and Drug Discovery. 3 Hours.

Emphasis on the structure-based design strategies for small organic molecule drugs using common macromolecular drug targets. Students in CH 771 should have had undergraduate preparation including organic chemistry and biochemistry or the equivalent.

CH 772. Chemistry of Natural Products. 3 Hours.

The principal focus of this course will be the introduction of synthesis and medicinal chemistry of natural products. Drugs discovery using natural products, with specific examples in the areas of antibacterials, anticancer, and analgesic drugs will be introduced. An overview of structural classes, biosynthetic pathways and application of asymmetric synthesis in the synthesis of specific examples from each class will be discussed. This course is intended for undergraduate students at the senior level.

CH 773. Electron Pushing and Total Synthesis. 3 Hours.

The advanced organic course is aimed to enhance students' comprehension of advanced organic chemistry theory and principles, and apply them to understand reaction mechanisms and tactic of total synthesis. It will cover different types of common organic reactions each week, for example, reactions involving anion intermediates, cation intermediates, rearrangement, photochemical process, carbonyl compounds, and other reactive intermediates. Using electron pushing for mechanistic reasoning will be emphasized.

CH 774. X-Ray Crystallography. 3 Hours.

Fundamental principles of X-ray crystallography. Students gain enough information to be able to collect meaningful data and analyze and refine structures. Students learn how to collect, process and analyze x-ray data, focus on heavy atom phasing techniques and use state of the art software for refinement. Permission of instructor.

CH 777. Fundamentals of Radiochemistry. 3 Hours.

This course is intended to act as an introduction to radiochemistry. It will cover production, instrumentation, and radiochemistry techniques to make use of radiotracers in the life sciences from basic biological and environmental applications to medical imaging and therapy.

CH 780. Polymer Chemistry I. 3 Hours.

Basic chemical principles of polymers with the focus on synthesis, characterization, and applications of synthetic and biological macromolecules. Includes laboratory. Prerequisites: undergraduate organic chemistry and permission of instructor.

CH 780L. Polymer Chemistry I Laboratory. 1 Hour.

Polymer Chemistry I Laboratory.

CH 781. Polymer Chemistry II. 3 Hours.

Fundamentals of chemical, physical, and molecular aspects of polymers in bulk and solutions. Prerequisites: undergraduate organic chemistry and permission of instructor.

Prerequisites: CH 780 [Min Grade: C]

CH 781L. Polymer Chemistry II Laboratory. 1 Hour.

Laboratory to accompany CH 781 (Polymer Chemistry II).

CH 783. Chemistry of Polymers and Polymeric Materials I. 3 Hours.

Basic chemical principles of polymers with the focus on synthesis, characterization, and applications of synthetic and biological macromolecules. No laboratory is required. This course sequence is for BME or Material Science Graduate Students. The laboratory accompanying Polymer Chemistry I is NOT required for these students. Permission of instructor is required before registration.

CH 784. Chemistry of Polymers and Polymeric Materials II. 3 Hours.

Fundamentals of chemical, physical and molecular aspects of polymers in bulk and solutions. No laboratory is required. This course sequence is for BME or Material Science Graduate Students. The laboratory accompanying Polymer Chemistry II is NOT required for these students. Permission of instructor is required for registration.

CH 789. Special Topics in Polymer Chemistry. 3 Hours.

Detailed consideration of areas of special interests in polymer chemistry.

Prerequisites: CH 580 [Min Grade: C] and CH 581 [Min Grade: C]

CH 790. Introduction to Graduate Research. 1 Hour.

The purpose of this course is to acquaint incoming graduate student with departmental, school and university policies and procedures for conducting research and teaching undergraduate students. Pass/Fail.

CH 791. Seminar. 1 Hour.

Seminars on current topics in chemical research.

CH 792. Seminar Presentation. 2 Hours.

Seminar given by graduate students on current topics in chemical research.

CH 798. Non-Dissertation Research. 1-12 Hour.

Prerequisite: Permission of graduate faculty member.

CH 799. Dissertation Research. 1-12 Hour.

Prerequisite: Admission to candidacy and permission of graduate faculty member. Must have graduate dean's approval of 5 member committee.

Must have IRB and graduate dean's approval of candidacy. Need at least 2 semesters of candidacy to graduate.

Prerequisites: GAC Z