

# DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY

Chemistry Building Room 238

T: 512-245-2156 F: 512-245-2374

[www.txstate.edu/chemistry](http://www.txstate.edu/chemistry) (<http://www.txstate.edu/chemistry>)

Chemistry is the central science and the study of chemistry provides the essential knowledge needed to address many of society's most pressing needs, such as feeding, clothing, and housing the peoples of the world; tapping new sources of energy; improving health and conquering disease; providing renewable substitutes for dwindling resources; strengthening our national security; and monitoring and protecting our environment. Basic research in chemistry will help future generations address their evolving needs and ensure a higher quality of life.

Chemists and biochemists can work in almost any field and find careers in teaching, research, production, quality control, technical services, and/or sales. Graduates from the Department of Chemistry and Biochemistry have an excellent record of job placement in industrial, academic, and government positions. Many also seek advanced degrees or pursue careers in medicine, dentistry, or pharmacy.

Chemistry and biochemistry majors gain skills in quantitative thinking and problem solving. Majors can work as laboratory instructors and supplemental instructors for lower division courses or as research assistants in faculty research laboratories. Students often participate in internships and research programs both on and off campus during the summer. The faculty, facilities, library holdings, and chemistry curriculum of the Department of Chemistry and Biochemistry have been accredited by the American Chemical Society. Recipients of a B.S. major in Chemistry or B.S. major in Biochemistry who have fulfilled the minimum requirements for professional chemists are awarded certificates by the American Chemical Society. Receipt of the ACS certificate is recommended as preparatory training for work in industry or for continued graduate studies in chemistry or biochemistry. The Biochemistry program is accredited by the American Society for Biochemistry and Molecular Biology and recipients of a B.S. major in Biochemistry are awarded an ASBMB-certified degree upon successful completion of a scored examination. Students completing the B.S. major in Chemistry or Biochemistry with a concentration in Pre-Pharmacy will be prepared for future professional studies in Pharmacy.

Students seeking a B.S. major in Chemistry begin their studies taking foundation courses in chemistry, physics and mathematics. After completion of the foundation courses, students take advanced courses and laboratories in physical chemistry, analytical chemistry, inorganic chemistry and organic chemistry. A minor is required for this degree.

Students seeking a B.S. major in Biochemistry begin their studies taking foundation courses in chemistry, biology, physics and mathematics. After completion of the foundation courses, students take advanced courses and laboratories to gain knowledge and experience in the modern techniques of biochemistry and molecular genetics. The Biochemistry curriculum meets the standards set by the American Society for Biochemistry and Molecular Biology. A minor is required for this degree.

Qualified chemistry or biochemistry majors completing their junior year of chemistry courses who plan to pursue advanced studies have the opportunity to complete both B.S. and M.S. degrees with one additional

year of course work and research after receipt of a B.S. degree. Students must be active in undergraduate research prior to their senior year to be eligible for the program.

## Pharmacy

Pharmacy is a professional program leading to a Doctor of Pharmacy (Pharm.D.) degree. The B.S. in Chemistry or Biochemistry with a Pre-Pharmacy concentration provides students with a strong foundation for future studies and includes prerequisite coursework required in order to apply to the professional programs in Pharmacy. The eight Pharmacy schools in Texas (Texas A&M Health Science Center Irma Lerma Rangel College of Pharmacy, Texas Southern University College of Pharmacy and Health Sciences, Texas Tech University Health Sciences Center School of Pharmacy, The University of Texas at Austin College of Pharmacy, The University of Texas at Tyler Ben and Maytee Fisch College of Pharmacy, University of Houston College of Pharmacy, University of the Incarnate Word Feik School of Pharmacy, and University of North Texas Health Science Center College of Pharmacy) all require prerequisite courses in chemistry, biology, math, physics, English, humanities and social sciences. Some requirements vary by professional school so it is imperative that pre-pharmacy students consult with a pre-pharmacy advisor prior to and during completion of their major at Texas State.

## Teacher Certification

Students may earn either a Chemistry (Grades 7-12) or Physical Science (Grades 6-12) certification in Texas, while pursuing a B.S. major in Chemistry. Initial or additional certification may also be acquired as a post-baccalaureate or graduate student. Students interested in certification are strongly encouraged to see the Science Advisor early in their undergraduate program or certification process.

## Bachelor of Science (B.S.)

- Major in Biochemistry (<http://mycatalog.txstate.edu/undergraduate/science-engineering/chemistry-biochemistry/biochemistry-bs>)
- Major in Biochemistry (American Chemical Society approved program) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/chemistry-biochemistry/biochemistryacs-bs>)
- Major in Biochemistry (Pre-Dental Concentration) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/chemistry-biochemistry/biochemistry-predental-bs>)
- Major in Biochemistry (Pre-Medical Concentration) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/chemistry-biochemistry/biochemistry-premedical-bs>)
- Major in Biochemistry (Pre-Pharmacy Concentration) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/chemistry-biochemistry/biochemistry-prepharmacy-bs>)
- Major in Chemistry (<http://mycatalog.txstate.edu/undergraduate/science-engineering/chemistry-biochemistry/chemistry-bs>)
- Major in Chemistry (Pre-Dental Concentration) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/chemistry-biochemistry/chemistry-predental-bs>)
- Major in Chemistry (Pre-Medical Concentration) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/chemistry-biochemistry/chemistry-premedical-bs>)
- Major in Chemistry (Pre-Pharmacy Concentration) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/chemistry-biochemistry/chemistry-prepharmacy-bs>)
- Major in Chemistry (Teacher Certification in Chemistry, Grades 7-12) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/>)

chemistry-biochemistry/chemistry-teacher-certification-grades-7-12-bs)

- Major in Chemistry (Teacher Certification in Physical Science, Grades 6-12) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/chemistry-biochemistry/chemistry-teacher-certification-physical-science-grades-6-12-bs>)

## Bachelor of Science (B.S.) and Master of Science (M.S.)

- Major in Biochemistry (Early-Entry Program) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/chemistry-biochemistry/biochemistry-early-entry-combined-program-bs-ms>)
- Major in Chemistry (Early-Entry Program) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/chemistry-biochemistry/chemistry-early-entry-combined-program-bs-ms>)

## Minors

- Biochemistry (<http://mycatalog.txstate.edu/undergraduate/science-engineering/chemistry-biochemistry/biochemistry-minor>)
- Chemistry (<http://mycatalog.txstate.edu/undergraduate/science-engineering/chemistry-biochemistry/chemistry-minor>)
- Second Teaching Field in Chemistry (Grades 7-12) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/chemistry-biochemistry/second-teaching-field-chemistry>)

## Courses in Chemistry (CHEM)

### CHEM 1141. General Chemistry Laboratory I.

First of two laboratory courses in general chemistry for science-related majors. Course introduces the students to the basics of experimental measurements, including density, separation techniques, formula determinations, titrations, thermodynamics, gas laws, and descriptive chemistry. Prerequisite or Co-requisite: CHEM 1341 or CHEM 1335, or CHEM 1310.

**1 Credit Hour. 0 Lecture Contact Hours. 3 Lab Contact Hours.**

**Grade Mode:** Standard Letter

**TCCN:** CHEM 1111

**Course Fee:** \$6; Fee - Lab CHEM

### CHEM 1142. General Chemistry Laboratory II.

Second of two laboratory courses in general chemistry. Laboratory techniques are emphasized, and applied to both qualitative and quantitative analysis. Prerequisites: CHEM 1341 and CHEM 1141 with a grade of "D" or better. Prerequisite or Co-requisite: CHEM 1342.

**1 Credit Hour. 0 Lecture Contact Hours. 3 Lab Contact Hours.**

**Grade Mode:** Standard Letter

**TCCN:** CHEM 1112

**Course Fee:** \$6; Fee - Lab CHEM

### CHEM 1310. Introductory Chemistry for Non-Science Majors.

A one semester principles course for students in non-science related majors. Course covers the major concepts of chemistry and the role of chemistry in contemporary society. Students will not receive credit for both CHEM 1310 and CHEM 1341.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**

**Course Attribute(s):** Life & Phys Sciences Core 030

**Grade Mode:** Standard Letter

**TCCN:** CHEM 1305

### CHEM 1330. Chemistry for Non-Science Majors.

This is the second of two lecture courses for non-science majors. The course surveys organic and biochemistry and current topics which may include energy-related topics, nuclear chemistry, environmental chemistry, medicinal chemistry, and synthetic and natural polymers. Prerequisite: CHEM 1310 or CHEM 1341 with a grade of "C" or better.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**

**Course Attribute(s):** Life & Phys Sciences Core 030

**Grade Mode:** Standard Letter

**TCCN:** CHEM 1307

### CHEM 1335. Engineering Chemistry.

This one semester lecture course is tailored to engineering students. Topics include stoichiometry, gases, chemical bonding and structure, periodic trends, materials, energy, kinetics, equilibrium, electrochemistry and nuclear chemistry. Course is a stand-alone course and does not serve as a prerequisite to any courses currently requiring CHEM 1341 as a prerequisite. Prerequisite: MATH 1315 with a grade of C or higher, ACT Mathematics score of 24 or more, SAT Mathematics score of 550 or more, Accuplacer College Mathematics score of 86 or more, or Compass College Algebra score of 46 or more.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**

**Course Attribute(s):** Life & Phys Sciences Core 030

**Grade Mode:** Standard Letter

### CHEM 1341. General Chemistry I.

Initial lecture course in general chemistry for science-related majors, covering atomic and molecular structure, bonding, states of matter, solutions, and descriptive chemistry. Students will not receive credit for both CHEM 1310 and CHEM 1341. Concurrent registration in CHEM 1141 is recommended. Prerequisite: MATH 1315 with a grade of C or higher, ACT Mathematics score of 24 or more, SAT Mathematics score of 550 or more, Accuplacer College Mathematics score of 86 or more, or Compass College Algebra score of 46 or more.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**

**Course Attribute(s):** Life & Phys Sciences Core 030

**Grade Mode:** Standard Letter

**TCCN:** CHEM 1311

### CHEM 1342. General Chemistry II.

Second of two lecture courses in general chemistry for science-related majors, covering equilibrium processes, acid-base chemistry, and kinetics, and electrochemistry. A basic knowledge of algebra is needed. Concurrent enrollment in CHEM 1142 is recommended. Prerequisite: CHEM 1341 with a grade of "C" or higher.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**

**Course Attribute(s):** Life & Phys Sciences Core 030

**Grade Mode:** Standard Letter

**TCCN:** CHEM 1312

**CHEM 2130. Laboratory Technique in Organic Chemistry.**

An optional laboratory to accompany CHEM 2330, covers experimental techniques of preparation, purification, and determination of physical and chemical properties of organic compounds. Prerequisites: CHEM 1342 and CHEM 1142 with a grade of "D" or better. Co-requisite: CHEM 2330.

**1 Credit Hour. 0 Lecture Contact Hours. 3 Lab Contact Hours.**

**Grade Mode:** Standard Letter

**Course Fee:** \$6; Fee - Lab CHEM

**CHEM 2141. Organic Chemistry Laboratory I.**

This laboratory introduces the student to the general techniques of organic chemistry. Prerequisites: CHEM 1342 with a grade of "C" or higher and CHEM 1142 with a grade of "D" or better. Prerequisite or Co-requisite: CHEM 2341 with a grade of "D" or better.

**1 Credit Hour. 0 Lecture Contact Hours. 3 Lab Contact Hours.**

**Grade Mode:** Standard Letter

**TCCN:** CHEM 2123

**Course Fee:** \$6; Fee - Lab CHEM

**CHEM 2142. Organic Chemistry Laboratory II.**

This laboratory involves the study of typical organic reactions. Prerequisites: CHEM 2341 with a grade of "C" or better and CHEM 2141 with a grade of "D" or better. Prerequisite or Co-requisite: CHEM 2342.

**1 Credit Hour. 0 Lecture Contact Hours. 3 Lab Contact Hours.**

**Grade Mode:** Standard Letter

**TCCN:** CHEM 2125

**Course Fee:** \$6; Fee - Lab CHEM

**CHEM 2150. Biochemistry & Metabolism Lab.**

An optional laboratory to accompany CHEM 2350. This laboratory examines the physical properties and chemistry of carbohydrates, amino acids, proteins, lipids and nucleotides. Course is designed for students majoring in nutrition, clinical laboratory science and agriculture. Prerequisites: CHEM 2330 and CHEM 2130 or CHEM 2342 and CHEM 2142 all with a grade of "D" or better. Co-requisite: CHEM 2350.

**1 Credit Hour. 0 Lecture Contact Hours. 3 Lab Contact Hours.**

**Grade Mode:** Standard Letter

**Course Fee:** \$6; Fee - Lab CHEM

**CHEM 2330. Fundamentals of Organic Chemistry.**

A one-semester course which covers nomenclature, structure and reactions of organic compounds with an introduction to bioorganic molecules. Course is designed for students majoring in nutrition, clinical laboratory sciences and agriculture. Prerequisites: CHEM 1342 and CHEM 1142 all with a grade of "D" or better.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**

**Grade Mode:** Standard Letter

**CHEM 2341. Organic Chemistry I.**

This course covers the nomenclature, reactions and reaction mechanisms of the hydrocarbons and the alkyl halides. Prerequisites: CHEM 1342 with a grade of "C" or higher. Pre- or Co-requisite: CHEM 1142 with a grade of "D" or better.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**

**Grade Mode:** Standard Letter

**TCCN:** CHEM 2323

**CHEM 2342. Organic Chemistry II.**

This course covers the nomenclature, reactions and reaction mechanisms of the major functional groups. Prerequisite: CHEM 2341 with a grade of "C" or higher. Prerequisite or Co-requisite: CHEM 2141 with a grade of "D" or better.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**

**Grade Mode:** Standard Letter

**TCCN:** CHEM 2325

**CHEM 2350. Biochemistry & Metabolism.**

A one-semester study of carbohydrate, proteins, lipids and nucleotides which presents both structure and intermediary metabolism along with an introduction to the function of enzymes and coenzymes.

Course is designed for students majoring in nutrition, clinical laboratory science and agriculture. Prerequisites: CHEM 2330 and CHEM 2130 or CHEM 2342 and CHEM 2142, all with a grade of "D" or better.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**

**Grade Mode:** Standard Letter

**CHEM 3245. Physical Chemistry Laboratory.**

Experiments illustrating principles and methods of physical chemistry are performed. Written reports on the experiments are prepared. Prerequisites: CHEM 3330 with a grade of "C" or better, and CHEM 3410 with a grade of "D" or better. Prerequisite or Co-requisite: CHEM 3340. (WI).

**2 Credit Hours. 1 Lecture Contact Hour. 4 Lab Contact Hours.**

**Course Attribute(s):** Lab Required/Writing Intensive

**Grade Mode:** Standard Letter

**Course Fee:** \$6; Fee - Lab CHEM

**CHEM 3276. Experimental Biochemistry.**

Course introduces biochemistry minors to the fundamental techniques used in modern biochemistry. Experiments use the essential techniques employed in the study of proteins, enzymes and nucleic acids with emphasis on the use of modern instrumentation and the manipulation and analysis of experimental data. Prerequisites: CHEM 3375 or CHEM 4375 with a grade of "C" or higher.

**2 Credit Hours. 1 Lecture Contact Hour. 4 Lab Contact Hours.**

**Course Attribute(s):** Lab Required

**Grade Mode:** Standard Letter

**CHEM 3330. Physical Chemistry I.**

The course covers principles of thermodynamics and thermochemistry, phase equilibria, electrochemistry and elementary kinetics including rate laws and mechanisms. Prerequisites: CHEM 1142 with a grade of "D" or better and CHEM 1342 and MATH 2472 with a grade of "C" or better.

**3 Credit Hours. 4 Lecture Contact Hours. 0 Lab Contact Hours.**

**Grade Mode:** Standard Letter

**CHEM 3340. Physical Chemistry II.**

The course covers kinetics, quantum mechanics, spectroscopy, and other selected topics. Prerequisites: CHEM 3330 and MATH 2472 and PHYS 2425, all with a grade of "C" or better.

**3 Credit Hours. 4 Lecture Contact Hours. 0 Lab Contact Hours.**

**Grade Mode:** Standard Letter

**CHEM 3341. Descriptive Inorganic Chemistry.**

An analysis of atomic, molecular, and solid state bonding and structure with an emphasis on coordination compounds and bioinorganic chemistry. Representative compounds and reactions of the elements will be surveyed. Prerequisite: CHEM 2342 with a grade of "C" or higher.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**

**Grade Mode:** Standard Letter

**CHEM 3375. Principles of Biochemistry.**

Course provides biochemistry majors and minors with a rigorous introduction to biochemistry. Topics include the chemical function and structure of proteins, nucleic acids, lipids and carbohydrates; enzyme mechanisms, kinetics and regulation. Prior completion or concurrent enrollment in BIO 2450 is strongly recommended. Prerequisites CHEM 2342 with a grade of "C" or better.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**

**Grade Mode:** Standard Letter

**CHEM 3380. Analytical Biochemistry.**

This course is designed to acquaint the student with the chemical and physical principles of modern biochemical methods. Emphasis is placed upon the application of the methods to current problems in biochemistry and molecular biology and the interpretation of data. Prerequisite: CHEM 3375 with a grade of "C" or better.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**

**Grade Mode:** Standard Letter

**CHEM 3381. Biochemistry Techniques.**

Course introduces biochemistry majors to techniques in analytical and physical biochemistry. Experiments reinforce fundamental concepts and utilize modern instrumentation. Experimental design, interpretation of results, and data reporting will be emphasized. Prior completion or concurrent enrollment in BIO 2400 is strongly recommended.

Prerequisites: CHEM 3375 with a grade of "C" or better, Biochemistry Majors Only. Corequisite: CHEM 3380 with a grade of "C" or better. (WI).

**3 Credit Hours. 2 Lecture Contact Hours. 4 Lab Contact Hours.**

**Course Attribute(s):** Writing Intensive

**Grade Mode:** Standard Letter

**CHEM 3390. Physical Chemistry for Biochemists.**

A study of the theories and laws of physical chemistry as it relates to biochemistry. The topics covered include ideal and real gases, classical thermodynamics, reaction kinetics, phase equilibria, electrochemistry, quantum mechanics, spectroscopy and statistical mechanics. Prerequisite: CHEM 3375 and MATH 2472 with a "C" or better.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**

**Grade Mode:** Standard Letter

**CHEM 3410. Quantitative Analysis.**

Course covers the general theory and practice of typical methods of gravimetric and volumetric analysis, satisfies the quantitative analysis requirements for chemistry majors, minors, pre-medical and pharmacy students. Prerequisites: CHEM 1342 with a grade of "C" or better, and CHEM 1142 with a grade of "D" or better.

**4 Credit Hours. 3 Lecture Contact Hours. 6 Lab Contact Hours.**

**Course Attribute(s):** Lab Required

**Grade Mode:** Standard Letter

**Course Fee:** \$6; Fee - Lab CHEM

**CHEM 4231. Advanced Laboratory I.**

An advanced integrated lab illustrating a variety of chemical techniques for the preparation, characterization and analysis of organic and inorganic materials. Prerequisites: CHEM 3245 and CHEM 3340 and CHEM 3410 all with a grade of "D" or better. Prerequisite or Co-requisite: CHEM 4331. (WI).

**2 Credit Hours. 1 Lecture Contact Hour. 4 Lab Contact Hours.**

**Course Attribute(s):** Lab Required|Writing Intensive

**Grade Mode:** Standard Letter

**Course Fee:** \$6; Fee - Lab CHEM

**CHEM 4241. Advanced Laboratory II.**

An advanced integrated lab illustrating a variety of chemical techniques for the preparation, characterization and analysis of inorganic and organic materials. Prerequisites: CHEM 4331 and CHEM 4231 all with a grade of "D" or better. Prerequisite or Co-requisite: CHEM 4341 with a grade of "D" or better. (WI).

**2 Credit Hours. 1 Lecture Contact Hour. 4 Lab Contact Hours.**

**Course Attribute(s):** Lab Required|Writing Intensive

**Grade Mode:** Standard Letter

**Course Fee:** \$6; Fee - Lab CHEM

**CHEM 4295. Laboratory Development and Practice.**

This course develops the laboratory instructional abilities of students seeking either 8-12 Chemistry or 8-12 Physical Science Teaching Certification. Topics include both traditional laboratory techniques and guided inquiry techniques, safety, laboratory management, pedagogical theory and practical knowledge of laboratory experiments. Prerequisite: Junior standing and an overall GPA of 2.5 or higher.

**2 Credit Hours. 1 Lecture Contact Hour. 2 Lab Contact Hours.**

**Course Attribute(s):** Lab Required

**Grade Mode:** Standard Letter

**Course Fee:** \$6; Fee - Lab CHEM

**CHEM 4299. Undergraduate Research.**

This course is available to undergraduate chemistry or biochemistry majors only. It may be repeated for credit but a maximum of four semester hours from this course are applicable toward advanced chemistry electives. Prerequisite: Permission of department.

**2 Credit Hours. 0 Lecture Contact Hours. 4 Lab Contact Hours.**

**Course Attribute(s):** Exclude from 3-peat Processing|Lab Required

**Grade Mode:** Standard Letter

**CHEM 4310. Medicinal Chemistry.**

This course surveys modern approaches to drug discovery and mechanisms of drug action with the focus on molecular structures of drugs. Examples of drug discovery for the chemotherapy of cancer, microbial and cardiovascular diseases will be examined. Prerequisites: CHEM 2342 and CHEM 2350 or CHEM 3375 or CHEM 4375 with grades of "C" or better.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**

**Grade Mode:** Standard Letter

**CHEM 4312. Organometallic Chemistry.**

This course will survey the structure, bonding, and reactivity of organometallic complexes. Homogeneous catalysis of the transition metals as well as the main group elements along with specialized "seminal research papers" in the field of organometallic chemistry will also be presented. Prerequisites: CHEM 2342 and CHEM 3341 with a grade of "C" or better.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**  
**Grade Mode:** Standard Letter

**CHEM 4331. Instrumental Analysis.**

The theory and methodology associated with the quantitative analysis of materials, i.e., electronics, spectroscopy, electrochemistry and chromatography are presented. Prerequisite: CHEM 3340 with a grade of "D" or better.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**  
**Grade Mode:** Standard Letter

**CHEM 4333. Spectroscopy.**

The study of various spectrometric techniques in qualitative and structural analysis of chemical substances. Prerequisite: CHEM 2342 with a grade of "C" or better.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**  
**Grade Mode:** Standard Letter

**CHEM 4341. Advanced Inorganic Chemistry.**

This course will use group theory analysis to predict vibrational spectra and bonding in molecules, including metal complexes. Numerous approaches (acid/base, redox, etc.) will be employed to rationalize the products of inorganic and organometallic reactions. The materials properties of solids and nanomaterials will also be discussed. Prerequisites: CHEM 3341 and CHEM 4331 all with a grade of "D" or better.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**  
**Grade Mode:** Standard Letter

**CHEM 4350. Modern Molecular Modeling.**

A study of the application of computational techniques to molecular modeling. Topics covered include quantum mechanical modeling, forcefield based molecular modeling, molecular energy minimization, molecular dynamics, vibrational spectra, solution of crystalline structures, diffraction patterns, molecular blends, phase equilibria, crystal morphology, physical property prediction and mesoscale modeling. Prerequisite: CHEM 3340.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**  
**Grade Mode:** Standard Letter

**CHEM 4351. Introduction to Polymers.**

This course is designed to develop the student's general understanding of polymer history and importance as well as terminology, structure, and synthesis. The overall scope of the course will be to develop the student's general knowledge of polymer synthesis and structure. Prerequisite: CHEM 2342 with a grade of "C" or better.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**  
**Grade Mode:** Standard Letter

**CHEM 4360. Molecular Biology.**

This course provides Biochemistry majors and minors with advanced knowledge of the field of molecular biochemistry. Topics include gene expression (transcription and translation of genes in bacteria and higher organisms), post-translational modification of proteins, chromosomal DNA replication, cell cycle checkpoint controls, DNA damage and repair, as well as theories of cancer and aging. Prerequisite: CHEM 3375 or CHEM 4375 all with a grade of "D" or better.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**  
**Grade Mode:** Standard Letter

**CHEM 4371. Directed Study.**

Independent study on a particular subject area in chemistry or biochemistry. The specific study area, resource material, goals, and achievements will be approved by the instructor. Prerequisites: CHEM 2342 with a "C" or better, and permission of department.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**  
**Course Attribute(s):** Exclude from 3-peat Processing  
**Grade Mode:** Standard Letter

**CHEM 4375. Biochemistry.**

Course provides Chemistry majors and minors with an overview of biochemistry topics. Topics include a description of the structure and function of proteins, enzymes, nucleic acids, lipids and carbohydrates. Students may not receive credit for both CHEM 3375 and CHEM 4375. Prerequisites: CHEM 2342 with a grade of "C" or better.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**  
**Grade Mode:** Standard Letter

**CHEM 4382. Advanced Biochemistry Research Laboratory II.**

This course is the second of two laboratory courses providing instruction in the modern techniques of biochemistry. Students will perform independent research projects involving isolation, manipulation and characterization of biomolecules. Results of these experiments and the scientific literature investigations will be used to prepare formal written reports and oral presentations. Prerequisite: CHEM 4481 with a grade of "C" or better. (WI).

**3 Credit Hours. 2 Lecture Contact Hours. 4 Lab Contact Hours.**  
**Course Attribute(s):** Writing Intensive  
**Grade Mode:** Standard Letter

**CHEM 4385. Metabolism.**

A study of the biodegradation and biosynthesis of carbohydrates, lipids, amino acids, proteins, and nucleic acids. Prerequisite: CHEM 3375 or CHEM 4375 all with a grade of "D" or better.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**  
**Grade Mode:** Standard Letter

**CHEM 4390. Supramolecular Chemistry.**

This course is designed to be a survey of the nature of non-covalent interactions between host and guest species. Emphasis will be focused on the rational design of hosts, thermodynamic and kinetic parameters involved in binding and the applications of various binding/recognition phenomena. Prerequisite: CHEM 2342 with a grade of "C" or better.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**  
**Course Attribute(s):** Writing Intensive  
**Grade Mode:** Standard Letter

**CHEM 4481. Advanced Biochemistry Lab I.**

The first of two laboratory courses providing instruction in the modern techniques of biochemistry. Experiments are performed on the isolation, manipulation and characterization of DNA, RNA and proteins. Students will prepare formal written reports and oral presentations. Prerequisites: CHEM 3381 with a grade of "C" or better; CHEM 3380. (WI).

**4 Credit Hours. 2 Lecture Contact Hours. 8 Lab Contact Hours.**

**Course Attribute(s):** Lab Required|Writing Intensive

**Grade Mode:** Standard Letter

**Course Fee:** \$6; Fee - Lab CHEM