Tulane University

DEPARTMENT OF CHEMISTRY

Programs

Undergraduate

Major

- Chemistry Major (https://catalog.tulane.edu/science-engineering/chemistry/chemistry-major)

Minor

- Chemistry Minor (https://catalog.tulane.edu/science-engineering/chemistry/chemistry-minor)

Graduate

- Chemistry, PhD (https://catalog.tulane.edu/science-engineering/chemistry/chemistry-phd)

Courses

Chemistry (CHEM)

CHEM 1070 General Chemistry I (3 Credit Hours)
An introduction to chemical principles. Stoichiometry, thermochemistry, states of matter, periodic relationships, atomic structure and bonding. Three hours of lecture per week. Concurrent registration in 1075 required.

Corequisite(s): CHEM 1075.

CHEM 1075 General Chemistry Lab I (1 Credit Hour)
Laboratory to accompany 1070. <u>Basic principles of chemical safety</u>. Introduction to laboratory techniques in chemistry. Experiments dealing with stoichiometry, thermochemistry, properties of gases, and simple analytical techniques. One three hour lab per week. Concurrent registration in 1070 required.

Corequisite(s): CHEM 1070.

CHEM 1080 General Chemistry II (3 Credit Hours)
The chemistry of solutions, equilibrium, thermodynamics, electrochemistry, kinetics. Three hours of lecture per week. Concurrent registration in 1085 required.

Prerequisite(s): (CHEM 1070, 1070, 1070 or 1070) and (CHEM 1075, 1075, 1075, 1075, 1170, 1170, 1170 or 1170).
Corequisite(s): CHEM 1085.

CHEM 1085 General Chemistry Lab II (1 Credit Hour)
A continuation of 1075. <u>Chemical safety in the workplace</u>. Experiments to illustrate principles of chemical equilibrium, electrochemistry, kinetics, thermodynamics, qualitative and quantitative analysis. One three hour laboratory per week. Concurrent registration in 1080 required.

Prerequisite(s): (CHEM 1070, 1070, 1070 or 1070) and (CHEM 1075, 1075, 1075, 1075, 1170, 1170, 1170 or 1170).
Corequisite(s): CHEM 1080.

CHEM 1890 Service Learning: CHEM 1070 (0-1 Credit Hours)
Corequisite(s): CHEM 1075.

CHEM 1940 Transfer Coursework (3-99 Credit Hours)

CHEM 2310 Quantitative Analysis (3 Credit Hours)
Basic theory of gravimetric, volumetric and selected instrumental methods of analysis. Three hours of lecture per week. Concurrent registration in 2330 required. Offered by arrangement.

CHEM 2315 Quantitative Analysis Lab (1 Credit Hour)
Laboratory to accompany 2310. Practice of gravimetric, volumetric and selected instrumental methods of analysis. Two four hour laboratory periods per week. Concurrent registration in 2310 required. Offered by arrangement.

CHEM 2410 Organic Chemistry I (3 Credit Hours)
An introduction to organic reaction mechanism and organic spectroscopy. Three hours of lecture per week. Concurrent registration in 2415 required.

Prerequisite(s): (CHEM 1080, 1080, 1080 or 1080) and CHEM 1085 or (CHEM 1085, 1085, 1085, 1180, 1180, 1180 or 1180).
Corequisite(s): CHEM 2415.

CHEM 2415 Organic Chemistry Lab I (1 Credit Hour)
Laboratory to accompany 2410. Introduction to laboratory techniques in organic chemistry. Synthesis of organic compounds. One four-hour laboratory period per week. Concurrent registration in 2410 required.

Prerequisite(s): (CHEM 1080, 1080, 1080 or 1080) and (CHEM 1085, 1085, 1085, 1085, 1180, 1180, 1180 or 1180).
Corequisite(s): CHEM 2410.

CHEM 2420 Organic Chemistry II (3 Credit Hours)
A continuation of 2410 with emphasis on mechanisms of organic reactions based on functional group reactivity. Three hours of lecture per week. Concurrent registration in 2440 required.

Prerequisite(s): (CHEM 2410, 2410, 2410 or 2410) and (CHEM 2430, 2430, 2430 or 2430) or CHEM 2415, 2415, 2415 or 2415.
Corequisite(s): CHEM 2425.

CHEM 2425 Organic Chemistry Lab II (1 Credit Hour)
Laboratory to accompany 2420. A continuation of 2415. Includes identification of unknown organic compounds. One four-hour laboratory period per week. Concurrent registration in 2420 required. Credit will not be given for both 22425 and H2480.

Prerequisite(s): CHEM 2415, 2415, 2415, 2415, 2430, 2430, 2430 or 2430.
Corequisite(s): CHEM 2420.

CHEM 2480 Chemistry of Energy (3 Credit Hours)
All of the energy flows, conversions, and transformations that occur in our environment directly or indirectly involve chemistry. This course will examine the chemistry associated with natural as well as human caused energy changes. The material will be presented at an introductory level. The only prerequisite is the first semester general chemistry (CHEM 1070). The course is designed for students with a serious interest in environmental issues. It will begin with the basic physics definitions of the different forms of energy and the conversions between forms. Next, the natural energy flows and transformations that occur in our environment will be examined with a particular emphasis on energy changes in chemical reactions. All living systems (including humans) depend on chemical energy. FInally, the human use of energy in the modern world will be explored.

CHEM 2500 Environmental Chemistry (3 Credit Hours)
An overview of the many aspects of environmental chemistry. Topics include: aquatic chemistry, including water pollution and water treatment; atmospheric chemistry, air pollution and major threats to the global atmosphere; geochemistry and soil chemistry; nature, sources, and environmental chemistry of hazardous wastes; and toxicology chemistry.

Prerequisite(s): (CHEM 1070, 1070, 1070 or 1070) and (CHEM 1080, 1080, 1080 or 1080).

CHEM 2890 Service Learning (0-1 Credit Hours)
Service learning component to CHEM courses. See Schedule of Classes each semester for offerings. 20 or 40 hours of public service with a CPS approved community partner.

CHEM 2940 Transfer Coursework (3 Credit Hours)

CHEM 3110 Physical Chemistry I (3 Credit Hours)
Elementary quantum mechanics, quantum theory of molecular structure and bonding, fundamentals of spectroscopy. Three hours of lecture per week.

Prerequisite(s): (CHEM 1080, 1080, 1080 or 1080) and (CHEM 1085, 1085, 1085, 1085, 1180, 1180, 1180 or 1180) and (MATH 2240, 2240, 2240 or 2240).
Corequisite(s): CHEM 3115.

CHEM 3115 Physical Chemistry Lab I (1 Credit Hour)
Laboratory to accompany 3110. Experiments in spectroscopy and spectroscopic analysis. One four-hour laboratory period per week. Concurrent registration in 3110 required.

Prerequisite(s): (CHEM 1080, 1080, 1080 or 1080) and (CHEM 1085, 1085, 1085, 1085, 1180, 1180, 1180 or 1180).
Corequisite(s): CHEM 3110.

CHEM 3120 Physical Chemistry II (3 Credit Hours)
First, Second, and Third laws of thermodynamics, thermodynamic energy state functions, phases of pure substances, properties of mixtures, chemical equilibrium, equilibrium electrochemistry, statistical thermodynamics. Three hours of lecture per week.

Prerequisite(s): (CHEM 1080, 1080, 1080 or 1080) or (CHEM 1085, 1085, 1085 or 1085) or (CHEM 1180, 1180 or 1180) and (MATH 2210, 2210, 2210 or 2210).
Corequisite(s): CHEM 3125.

CHEM 3125 Physical Chemistry Lab II (1 Credit Hour)
Laboratory to accompany CHEM 3120. Experiments illustrate thermodynamic and statistical mechanical principles. One four-hour laboratory period per week. Concurrent registration in CHEM 3120 required.

Prerequisite(s): CHEM 1085 or 1180.

CHEM 3210 Inorganic Chemistry (3 Credit Hours)
Periodic relationships, types of bonding, coordination complexes, acid-base concepts, inorganic reaction mechanisms. Three hours of lecture per week. Concurrent registration in 3230 required.

Prerequisite(s): CHEM 3110 and 3115.
Corequisite(s): CHEM 3215.

CHEM 3215 Inorganic Chemistry Lab (1 Credit Hour)
Laboratory to accompany 3210. Synthetic methods in inorganic and organometallic chemistry. Use of instrumental methods in organic chemistry. One four hour laboratory period per week. Concurrent registration in 3210 required.

Prerequisite(s): CHEM 3110 and 3115.
Corequisite(s): CHEM 3210.

CHEM 3310 Instrumental Analysis (3 Credit Hours)
Introduction to modern methods of instrumental analysis including separation techniques and spectroscopic and electrochemical methods. Three hours of lecture per week. Concurrent registration in 3330 required. Offered in alternate years.

Prerequisite(s): CHEM 2410.

CHEM 3315 Instrumental Analysis Lab (1 Credit Hour)
Laboratory to accompany 3310. Practice of separation techniques and spectroscopic and electrochemical methods of analysis. Two four-hour laboratory periods per week. Concurrent registration in 3310 required. Offered in alternate years.

Corequisite(s): CHEM 3310.

CHEM 3660 Special Topics (1-3 Credit Hours)
Special topics in Chemistry.

CHEM 3665 Special Topics Lab (1-3 Credit Hours)
Courses offered by visiting professors or permanent faculty primarily for undergraduates. For description, consult department.

CHEM 3830 Intro To Biochemistry (3 Credit Hours)
Properties of biological compounds. Bioenergetics, basic metabolic pathways, general biochemical mechanisms. Offered jointly with the cell and molecular biology department.

CHEM 3835 Intro to Biochem Lab (2 Credit Hours)
Eight hours of laboratory per week. Offered in the Fall semester.

CHEM 3840 Intermediate Biochem (3 Credit Hours)
Intermediary metabolism with emphasis on the integration of lipid, saccharide, and amino acid metabolism. Electron transport and oxidative phosphorylation. Photosynthesis. Purine and pyrimidine metabolism. Offered jointly with the cell and molecular biology department.

Prerequisite(s): CHEM 3830.

CHEM 3890 Service Learning: CHEM 3915 (0-1 Credit Hours)

CHEM 3915 Special Topics in Chemistry (1-3 Credit Hours)

CHEM 3940 Transfer Coursework (1-4 Credit Hours)
Transfer Coursework.

CHEM 4010 Research and Seminar (1-3 Credit Hours)
Individual research supervised by the faculty. Students are expected to present a short seminar based on their research. At least 10 hours of research effort per week. A maximum of three credits may be taken.

CHEM 4020 Research and Seminar (1-3 Credit Hours)
Same as 4010 in organization. A maximum of three credits may be taken.

CHEM 4030 Research & Seminar (1-3 Credit Hours)
Individual research supervised by the faculty. Students are expected to present a short seminar based on their research

CHEM 4660 Special Topics (1-3 Credit Hours)
Courses offered by visiting professors or permanent faculty primarily for undergraduates. For description, consult department.

CHEM 4890 Service Learning: (0-1 Credit Hours)

CHEM 4910 Independent Study (1-4 Credit Hours)
Laboratory or library research under direction of a faculty member.

CHEM 4920 Independent Study (1-3 Credit Hours)

CHEM 4940 Transfer Coursework (1-4 Credit Hours)
Transfer Coursework.

CHEM 4990 Honors Thesis (3 Credit Hours)
Honors thesis research, first semester. Register in department.

CHEM 5000 Honors Thesis (4 Credit Hours)
Honors thesis research, second semester. Register in department.

CHEM 5380 Study Abroad (1-20 Credit Hours)
Courses taught abroad by non-Tulane faculty. Does not count toward Tulane GPA.

CHEM 5390 Study Abroad (1-20 Credit Hours)
Courses taught abroad by non-Tulane faculty. Does not count toward Tulane GPA.

CHEM 6150 Interm Physical Chem I (3 Credit Hours)
Elementary quantum mechanics, quantum theory of molecular structure and bonding, fundamentals of spectroscopy.

CHEM 6160 Interm Physical Chem II (3 Credit Hours)
First, Second, and Third Laws of thermodynamics, thermodynamic energy state functions, phases of pure substances, properties of mixtures, chemical equilibrium, equilibrium electrochemistry, statistical thermodynamics.

CHEM 6250 Intermediate Inorganic (3 Credit Hours)
Periodic relationships, types of bonding, coordination complexes, acid-base concepts, inoganic reaction mechanisms.

CHEM 6460 Intermediate Organic (3 Credit Hours)
Structural, chemical, and physical properties of organic compounds.

CHEM 6660 Special Topics (1-3 Credit Hours)
Courses offered by visiting professors or permanent faculty primarily for undergraduates. For description, consult department.

CHEM 6830 Intro To Biochemistry (3 Credit Hours)
Properties of biological compounds, Bioenergetics, basic metabolic pathways, general biochemistry mechanisms.

CHEM 6840 Intermediate Biochemistry (3 Credit Hours)
Intermediary metabolism with emphasis on the integration of lipid, saccharide, and amino acid metabolism. Electron transport and oxidative phosphorylation.

CHEM 6940 Transfer Coursework (1-4 Credit Hours)
Transfer Coursework.

CHEM 7010 Independent Study (1-3 Credit Hours)
This is a directed study course that allows a graduate student to pursue a topic of particular interest under the direction of a faculty member.

CHEM 7020 Independent Study (1-3 Credit Hours)

CHEM 7110 Intro to Quantum Mechanics (3 Credit Hours)
The classical wave equation; the Schrödinger equation; principles of quantum mechanics; harmonic oscillator; rigid rotor; hydrogen atom; approximate methods: perturbation theory, variational principle.

CHEM 7120 Statistical Mechanics (3 Credit Hours)
Review of the principles of thermodynamics; canonical and other ensembles; Bose-Einstein, Fermi-Dirac, and Boltzmann statistics; non-interacting system; Monte Carlo methods; phase transitions, classical fluids; non-equilibrium systems.

CHEM 7130 Advanced Quantum Chemistry (3 Credit Hours)
Advanced topics in quantum chemistry and dynamics.

CHEM 7140 Computational Quamtum Chem (3 Credit Hours)
This introductory course in computational quantum chemistry will discuss selected topics of molecular modelling with an emphasis on quantum mechanical methods. The scope of this course incorporates ab initio methods, density functional theory, molecular mechanics, and semiempirical approaches. This course is set up for graduate-level requirements, but should be accessible to advanced undergraduates. Graduate-level quantum mechanics is not required, but a good undergraduate-level quantum chemistry background is expected.

CHEM 7150 Chemical Physics (3 Credit Hours)
Classical and quantum theory of radiation.

CHEM 7190 Selected Topics Physical Chemi (3 Credit Hours)
Selected topics in experimental and/or theoretical physical chemistry

CHEM 7210 Inorganic Stru & Bond (3 Credit Hours)
Descriptions of bonding theories as applied to inorganic systems. The course covers symmetry and group theory, crystal field theory, and generalized aspects of molecular orbital theory. Three hours of lecture per week.

CHEM 7220 Inorganic Reaction Mechanics (3 Credit Hours)
The course discusses the primary reactions of transition metal, organometallic and main group compounds. Concepts of chemical kinetics are applied to inorganic substitution, isomerization, oxidation/reduction, catalysis and photochemistry. The theoretical framework associated with electron and atom transfer reactions is also presented.

CHEM 7230 Organomet/Trans. Metals (3 Credit Hours)
The chemistry of compounds containing transition metal-carbon bonds. A survey of major classes of organotransition metal compounds, their bonding, and their reaction chemistry. The role of transition metal organometallic compounds in homogeneous catalysis. Three hours of lecture per week.

CHEM 7240 Organomat Chem Main Grp Metals (3 Credit Hours)
The chemistry of compounds containing main group metal-carbon bonds. A survey of major classes of organometallic compounds, their bonding, and their reaction chemistry. The role of main group organometallic compounds in organic synthesis and polymer chemistry. Three hours of lecture per week.

CHEM 7250 Phys Meth Inorganic Chem (3 Credit Hours)
This course is a problem solving based course focusing on characterization of inorganic substances using methods common to Inorganic Chemistry including multinuclear NMR, ESR, Mass Spectrometry, IR, electrochemical methods, magnetic methods and other more specialized techniques.

CHEM 7260 Crystallography (3 Credit Hours)
Basic principles of single crystal x-ray diffraction and their applications to the determination of the structures of small molecules. Each student will collect x-ray data on a crystal and determine the structure of the molecule.

CHEM 7270 Photochemistry (3 Credit Hours)
Photophysical processes, experimental methods, photochemistry of transition metal complexes, photosynthesis, solar photochemistry, photoinduced energy and electron transfer processes, photochromism.

CHEM 7280 Inorganic Nanochemsitry (3 Credit Hours)
The course will explore a variety of systems 0D (nanoparticles), 1D (nanotubes, nanoribbons), and 2D (nanosheets) using a number of illustrative examples, including gold and silica nanoparticles, silicon nanotubes, fullerenes, and graphenes. Emphasis will be placed on synthetic methods, characterization techniques, and applications.

CHEM 7290 Selected Topics Inorg Chem (3 Credit Hours)
The chemistry of metals in biology. An overview of the important metalloenzyme systems and other metallobiomolecules, such as O2 transport proteins. The course also covers inorganic pharmaceuticals and metal-based imaging agents in medicine. Three hours of lecture per week.

CHEM 7390 Selected Topics Biolog Chem (3 Credit Hours)
Biochemical and biophysical methods, mechanisms of enzyme catalysis, membrane structure and function, metabolic regulation, physical biochemistry, protein folding related topics.

CHEM 7410 Adv Organic Physical Organic (3 Credit Hours)
This course focuses on the fundamentals of Organic Chemistry, including molecular orbital theory, thermochemistry/strain/stability, stereochemistry, acid/base chemistry, reactivity, kinetics, and catalysis. The course is designed to provide the theoretical foundation behind experimental synthetic chemistry.

CHEM 7420 Adv Organic Spectroscopy (3 Credit Hours)
This course covers the elementary theory and slightly more advanced interpretation of common instrumental methods employed by organic chemists. These include NMR spectroscopy (including some 2D, multinuclear, and dynamic NMR), mass spectrometry, X-ray crystallography, IR, UV, and EPR spectroscopy, and various chiroptical methods.

CHEM 7430 Adv Organic Chem Natural Prod (3 Credit Hours)
Structural determination, synthesis, and biosynthesis of both classical and modern natural product target molecules.

CHEM 7440 Adv Organic Polymer Chemistry (3 Credit Hours)
This course establishes a basic fundamental background for polymer chemists, including the major synthetic techniques for preparing polymers, the strengths and weakness of various techniques for determining molecular weight and structure, as well as correlation between polymer molecular structure and the resultant physical properties (and therefore useful applications).

CHEM 7450 Adv Organic Supramolecular Che (3 Credit Hours)
This course focuses on a variety of aspects of supramolecular chemistry. It includes the fundamental physical chemistry important to the field and a review of the current state-of-the-art. The course also includes hands-on experience with analyzing supramolecular systems using spectroscopic and/or calorimetric approaches.

CHEM 7460 Adv Organic-Synthetic Ap (3 Credit Hours)
Design of syntheses for complex organic molecules. The strategies involved for constructing molecules with complex stereo and regio chemistry, while addressing issues of efficiency and yield.

CHEM 7470 Adv Organic Chem Nucleic Acids (3 Credit Hours)
This course provides a background to understanding the structure of nucleic acids and the forces involved in their binding and recognition. A particular focus involves the how to design sequences that enable binding, including topics such as using aptamers for selective binding and recognition.

CHEM 7490 Selected Topics Org Chem I (3 Credit Hours)
This is a survey course covering key topics in contemporary organic chemistry. The focus is on growing and far-reaching issues that are central to all forms of organic chemistry research.

CHEM 7491 Selected Topics Org Chem II (3 Credit Hours)
This is an in-depth course covering a key, topic of contemporary organic chemistry. The focus is on growing and far-reaching issues that are central to organic chemistry research in an academic or industrial setting.

CHEM 7660 Special Topics (0-4 Credit Hours)
Special Topics.

CHEM 7870 Division Seminar (1 Credit Hour)
Weekly seminars by visiting faculty and students.

CHEM 7880 Division Seminar (1,2 Credit Hours)
Weekly seminars by visiting faculty and students.

CHEM 7890 Techniques of Research (1-9 Credit Hours)

CHEM 7900 Techniques of Research (1-9 Credit Hours)

CHEM 7940 Transfer Credit-Grad (1-12 Credit Hours)

CHEM 9980 Masters Research (3 Credit Hours)
Research toward completion of a masters degree.

CHEM 9990 Dissertation Research (3 Credit Hours)
Research toward completion of a doctoral degree.