

Department of Chemistry and Biochemistry

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Degree Programs Offered

- BA, major in Chemistry
- BS, major in Chemistry
- BS, major in Biochemistry

Minors Offered

- Chemistry
- Biochemistry

The science of chemistry provides the basic 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 cope with their evolving needs and unanticipated problems. Chemistry and biochemistry majors gain skills in quantitative thinking and problem solving. Advanced students can work as laboratory instructors for lower division courses or as research assistants in the department's research laboratories. The faculty, facilities, library holdings, and chemistry curriculum of the Department of Chemistry and Biochemistry have been accredited by the American Chemical Society.

Chemists and biochemists work in research, production, quality control, technical services, and/or sales. Graduates have an excellent record of job placement in such diverse areas as the petrochemical industry, computer chip manufacturing, aerospace companies, pharmaceutical companies, the food industry, or as teachers in secondary schools. Many also seek advanced degrees or pursue careers in medicine, dentistry, or pharmacy.

Recipients of the BS in Chemistry are awarded certificates by the American Chemical Society stating that the minimum requirements for professional chemists have been fulfilled. This program is recommended as preparatory training for graduate or industrial work in chemistry.

The BA in Chemistry is a liberal arts degree designed for students who need a background in chemistry in preparation for other careers, i.e., medicine, dentistry, pharmacy, patent law.

The BS in Biochemistry is a degree program that prepares students for careers or advanced study in the biochemical sciences. The program is laboratory intensive and provides students instruction in the modern techniques of biochemistry and molecular genetics.

Bachelor of Arts Major in Chemistry

Minimum required: 128-136 semester hours

General Requirements:

1. A teaching certificate is available with this degree but will require additional hours.
2. A minimum of 9 writing intensive hours and a total of 39 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
3. See the University College section of this catalog for general education core curriculum requirements.

Freshman Year		Hours	Sophomore Year		Hours
CHEM 1141, 1341.....	4		CHEM 2141, 2341	4	
CHEM 1142, 1342.....	4		CHEM 2142, 2342	4	
ENG 1310, 1320	6		ENG 3303	3	
US 1100.....	1		ENG Literature (see general requirements 3).....	3	
HIST 1310, 1320	6		MATH 2471, 2472	8	
MATH 2417	4		PHYS 1410, 1420 or 1430, 2425.....	8	
Minor	3		POSI 2310, 2320	6	
PHIL 1305	3				
PFW two courses.....	2				
Total	33		Total	36	
Junior Year		Hours	Senior Year		Hours
ART, DAN, MU, or TH 2313.....	3		CHEM advanced elective		
CHEM 3245, 3330, 3340, 3410.....	12		(see general requirements 2).....	3	
Minor (see general requirements 2)	6-8		CHEM 4241, 4341	5	
Modern Language 1410, 1420	8		COMM 1310	3	
Social Science Component			Electives or advanced electives	7	
(see general requirements 3).....	3		Minor, advanced		
			(see general requirements 2).....	3-9	
			Modern Language 2310, 2320.....	6	
Total	32-34		Total	27-33	

Bachelor of Science Major in Chemistry

Minimum required: 128 semester hours

General Requirements:

1. A major in chemistry consists of CHEM 1141, 1341, 1142, 1342, 2141, 2341, 2142, 2342, 3245, 3330, 3340, 3410, 4231, 4241, 4331, 4341, 4375, and at least three semester hours of upper-level CHEM electives.
2. Students should consult a departmental adviser before selecting a minor.
3. A teaching certificate is available with this degree but will require additional hours
4. A minimum of 9 writing intensive hours and a total of 39 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
5. If two years of the same foreign language were taken in high school, then enough additional hours to total the minimum 128 hours required for the degree will fulfill this requirement. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
6. See the University College section of this catalog for general education core curriculum requirements.

Freshman Year		Hours	Sophomore Year		Hours
CHEM 1141, 1341.....	4		CHEM 2141, 2341	4	
CHEM 1142, 1342.....	4		CHEM 2142, 2342	4	
ENG 1310, 1320	6		ENG 3303	3	
US 1100	1		ENG Literature (see general requirements 6).....	3	
HIST 1310, 1320	6		MATH 2471, 2472	8	
MATH 2417	4		Minor.....	4	
PHIL 1305	3		PHYS 1430, 2425.....	8	
PFW two courses.....	2				
COMM 1310	3				
Total	33		Total	34	

Junior Year	Hours	Senior Year	Hours
CHEM 3245, 3330, 3340, 3410.....	12	ART, DAN, MU, or TH 2313	3
Minor (see general requirements 4)	12	CHEM 4231, 4241, 4331, 4341, 4375.....	13
POSI 2310, 2320.....	6	CHEM advanced elective.....	3
		Minor and Electives (see general requirements 4).....	9
		Social Science Component (see general requirements 6).....	3
Total	30	Total	31

**Bachelor of Science
Major in Biochemistry**

Minimum required: 128 semester hours

General Information:

1. Recommended minor is biology.
2. A minimum of 9 writing intensive hours and a total of 39 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
3. If two years of the same foreign language were taken in high school, then enough additional hours to total the minimum 128 hours required for the degree will fulfill this requirement. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. Two semesters of CHEM 4299 is highly recommended.
5. See the University College section of this catalog for general education core curriculum requirements.

Freshman Year	Hours	Sophomore Year	Hours
CHEM 1141, 1341.....	4	CHEM 2141, 2341	4
CHEM 1142, 1342.....	4	CHEM 2142, 2342	4
ENG 1310, 1320.....	6	ENG 3303	3
US 1100.....	1	ENG Literature (see general requirements 5)	3
HIST 1310, 1320	6	MATH 2471, 2472	8
BIO 1430, 1431	8	BIO 2450.....	4
PFW two courses.....	2	PHYS 1430, 2425.....	8
COMM 1310	3		
Total	34	Total	34

Junior Year	Hours	Senior Year	Hours
CHEM 3375, 3330, 3275, 3380.....	11	ART, MU, DAN or TH 2313	3
BIO 2400	4	CHEM 4360, 4481, 4482, 4385.....	14
Minor.....	6	Minor and advanced electives (see general requirements 2).....	10
PHIL 1305	3	Social Science component (see general requirements 5).....	3
POSI 2310, 2320.....	6		
Total	30	Total	30

Teacher Certification

Currently, there are six Texas Grades 8-12 science certifications: Computer Science, Life Sciences, Mathematics, Physical Sciences, Science, and Technology. Students seeking any of these certifications need to follow coursework leading to a degree in the appropriate science field, in addition to taking the required certification courses prescribed in the College of Science section. 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.

Minor in Chemistry

A minor in chemistry requires CHEM 1141 and 1341, 1142 and 1342, 2141 and 2341, 2142 and 2342, 3410, and one advanced course with a minimum of 3 advanced hours, not to include CHEM 4299.

Minor in Biochemistry

A minor in biochemistry can also be obtained and requires CHEM 1141 and 1341, 1142 and 1342, 2141 and 2341, 2142 and 2342, 3275, 3375, and 4360 or 4385.

Courses in Chemistry (CHEM)

1141 (CHEM 1111) General Chemistry Laboratory I. (0-3) 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 1310.

1142 (CHEM 1112) General Chemistry Laboratory II. (0-3) Second of two laboratory courses in general chemistry. Laboratory techniques are emphasized, and applied to both qualitative and quantitative analysis. Prerequisites: CHEM 1341, 1141. Prerequisite or Co-requisite: CHEM 1342 with a grade of "C" or higher.

1310 (CHEM 1305) Introductory Chemistry for Non-Science Majors. (3-0) A one-semester principles course for students in non-science related majors which covers not only the major concepts of chemistry (chemical theory, stoichiometry, bonding and elementary thermodynamics) but also the role of chemistry in problems of contemporary society (energy, pollution, water, etc.). Must be followed by CHEM 1430 for general education credit.

1341 (CHEM 1311) General Chemistry I. (3-0) Initial lecture course in general chemistry for science-related majors, covering atomic and molecular structure, bonding, states of matter, solutions, and descriptive chemistry. Concurrent registration in CHEM 1141 is recommended. Prerequisite: Mathematics ACT score of at least 24 (SAT 500 or SAT re-centered 520) or MATH 1315 with a grade of "C" or higher.

1342 (CHEM 1312) General Chemistry II. (3-0) 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 1132 is recommended. Prerequisite: CHEM 1341 with a grade of "C" or higher.

1430 (CHEM 1407) Chemistry for Non-Science Majors. (3-3) A one semester course which surveys organic and biochemistry and may include petro-chemistry, nuclear chemistry, synthetic and natural polymers. Prerequisite: CHEM 1310 or 1341.

2130 Laboratory Technique in Organic Chemistry. (0-3) 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 1342/1142. Co-requisite: CHEM 2330.

2141 (CHEM 2123) Organic Chemistry Laboratory I. (0-3) This laboratory introduces the student to the general techniques of organic chemistry. Prerequisites: CHEM 1342, 1142 with a grade of "C" or higher. Prerequisite or Co-requisite: CHEM 2341.

2142 (CHEM 2125) Organic Chemistry Laboratory II. (0-3) This laboratory involves the study of typical organic reactions. Prerequisites: CHEM 2341 and CHEM 2141 with grades of "C" or higher. Prerequisite or Co-requisite: CHEM 2342.

2150 Biochemistry & Metabolism Lab. (0-3) 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 2330/2330 or 2342/2142. Co-requisite: CHEM 2350.

2330 Fundamentals of Organic Chemistry. (3-0) 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 1342/1142.

2341 (CHEM 2323) Organic Chemistry I. (3-0) This course covers the nomenclature, reactions and reaction mechanisms of the hydrocarbons and the alkyl halides. Prerequisites: CHEM 1342/1142 with a grade of "C" or higher.

2342 (CHEM 2325) Organic Chemistry II. (3-0) 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.

2350 Biochemistry & Metabolism. (3-0) 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 2330/2130 or CHEM 2342/2142.

2390 Environmental Chemistry. (3-0) Environmental chemistry examines sources, reactions, transport and fate of chemical entities in the environment, as well as their effects on human health and the natural environment. This multidisciplinary subject draws from such fields as geology, physics, toxicology, limnology, water-treatment and chemistry. Prerequisites: CHEM 1341/1141, 1342/1142.

(WI) **3245 Physical Chemistry Laboratory. (1-4)** Experiments illustrating principles and methods of physical chemistry are performed. Written reports on the experiments are prepared. Prerequisites: CHEM 3330, 3410.

(WI) **3275 Biochemical Techniques. (1-4)** Course introduces students 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 instruments and the manipulation and analysis of experimental data. Prerequisite: CHEM 3375 with a grade of "C" or higher.

3330 Physical Chemistry I. (3-0) The course covers principles of thermodynamics and thermochemistry, phase equilibria, electrochemistry and elementary kinetics including rate laws and mechanisms. Prerequisites: CHEM 1342/1142 and MATH 2472 with grades of "C" or higher.

3340 Physical Chemistry II. (3-0) The course covers mechanics, spectroscopy and statistical thermodynamics and other selected topics. Prerequisites: CHEM 3330; MATH 2472; PHYS 2425 or 1420.

3350 Physical Chemistry for Biochemists. (3-0) A study of the fundamental theories and laws of physical chemistry as it relates to biochemistry. The topics to be covered include ideal and real gases, classical thermodynamics, reaction kinetics, phase equilibria, electrochemistry, quantum mechanics, spectroscopy and statistical mechanics. Prerequisite or Co-requisite: CHEM 3375.

3375 Principles of Biochemistry. (3-0) This course provides biochemistry majors and minors with a strong foundation in the principles of biochemistry. Topics include the chemical function and structure of proteins, nucleic acids, lipids and carbohydrates; enzyme structure, mechanism and kinetics; and the essential mechanisms used to control enzyme activity. Prerequisite: CHEM 2342 with a grade of "C" or higher.

3380 Physical Methods in Biochemistry. (3-0) 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 higher.

3410 Quantitative Analysis. (3-6) 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 1342/1142.

(WI) **4231 Advanced Laboratory I.** (2-4) An advanced integrated lab illustrating a variety of chemical techniques for the preparation, characterization and analysis of organic and inorganic materials. Prerequisites: CHEM 3245, 3340, 3410. Prerequisite or Co-requisite: CHEM 4331.

(WI) **4241 Advanced Laboratory II.** (2-4) An advanced integrated lab illustrating a variety of chemical techniques for the preparation, characterization and analysis of inorganic and organic materials. Prerequisites: CHEM 3245, 3340, 3410. Prerequisite or Co-requisite: CHEM 4341.

4299 Undergraduate Research. (0-4) This course is available to undergraduate chemistry majors only. It may be repeated but a maximum of four semester hours from this course are applicable toward the Bachelor of Science degree. Prerequisite: Permission of department.

4331 Instrumental Analysis. (3-0) The theory and methodology associated with the quantitative analysis of materials, i.e., electronics, spectroscopy, electrochemistry and chromatography are presented. Prerequisite: CHEM 3340.

4333 Spectroscopy. (3-0) The study of various spectrometric techniques in qualitative and structural analysis of chemical substances. Prerequisites: CHEM 2142/2342.

4341 Advanced Inorganic Chemistry. (3-0) Chemical bonding, coordination chemistry compounds, acid-base concepts, and other topics are included along with some descriptive chemistry. Prerequisite: CHEM 3340.

4350 Modern Molecular Modeling. (3-0) 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.

4351 Introduction to Polymers. (3-0) 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.

4360 Advanced Biochemistry and Molecular Biology. (3-0) 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.

4371 Directed Study. (3-0) Independent study on a particular subject area in chemistry. The specific study area, resource material, goals, and achievements will be approved by the instructor. May be repeated once for additional credit. Prerequisites: CHEM 2142/2342, 3410, and permission of instructor.

4375 Biochemistry. (3-0) A course devoted to a study of the chemistry of carbohydrates, lipids, proteins, enzymes, and nucleo-proteins. A study of enzyme kinetics and thermodynamics of coupled reactions is included. Prerequisites: CHEM 2342 with a grade of "C" or higher, 2142.

4385 Metabolism. (3-0) A study of the biodegradation and biosynthesis of carbohydrates, lipids, amino acids, proteins, and nucleic acids. Prerequisites: CHEM 2342 with a grade of "C" or higher, 2142.

4390 Supramolecular Chemistry. (3-0) 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. Prerequisites: CHEM 3275 with a grade of "C" or higher; CHEM 3380.

(WI) **4481 Advanced Biochemistry Lab I. (2-8)** 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 3275 with a grade of "C" or higher; CHEM 3380.

(WI) **4482 Advanced Biochemistry Lab II. (2-8)** The second 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 use their results and the scientific literature to prepare formal written reports and oral presentations. Prerequisite: CHEM 4481.