Graduate Degrees

The department offers degree programs leading to the Master of Arts (MA), Master of Science (MS) and Doctor of Philosophy (PhD) with a major in biology; MS and PhD with a major in biochemistry; MS and PhD with a major in environmental science; and MA and MS with a major in molecular biology. A PhD with a major in molecular biology is offered through the Federation of North Texas Area Universities, of which UNT is a member.

Students who intend to proceed with graduate study should take the Graduate Record Examination (GRE) during their senior year. For specific information on graduate degree programs, consult the *Graduate Catalog.*

Courses of Instruction

All Courses of Instruction are located in one section at the back of this catalog.

Course and Subject Guide

The "Course and Subject Guide," found in the Courses of Instruction section of this book, serves as a table of contents and provides quick access to subject areas and prefixes.

Department of Chemistry

Main Departmental Office
Chemistry Building, Room 101

Mailing Address:
1155 Union Circle #305070
Denton, TX 76203-5017
940-565-2713
Fax: 940-565-4318

E-mail: chem@unt.edu
Web site: *www.chem.unt.edu*

Undergraduate Advising Office
Chemistry Building, Room 207
940-565-3554
Fax: 940-369-8474

William Acree, Chair

Faculty

Professors Acree, Borden, Chyan, Cundari, Kelber, J. Marshall, P. Marshall, Richmond, Schwartz, Theriot, Thomas. *Associate Professors* Golden, Mason, Omary, Wilson. *Assistant Professors* Cooke, Petros, Verbeck, Youngblood. *Lecturers* Dandekar, Schaake.

Introduction

Chemistry, the study of matter and its reactions, provides a basic understanding needed to deal with a variety of societal and scientific needs, including energy, food production, health and medicine, biotechnology, new materials, environmental concerns, new processes, and national defense. Chemistry is a science central to the study of modern physics, biology and medicine.

Current frontiers of experimental and theoretical chemical investigation involve the areas of chemical reactions and reactivity, synthesis, analytical methods, catalysis, materials and life processes.

Preprofessional Programs

See "Preprofessional Programs" in the College of Arts and Sciences section of this catalog.

Programs of Study

The department offers undergraduate and graduate programs in the following areas:

- Bachelor of Arts with a major in chemistry;
- Bachelor of Science in Chemistry;

- Master of Science, and
- Doctor of Philosophy, both with a major in chemistry.

Concentrations under the chemistry major at the master's and doctoral level are available in chemistry education, analytical chemistry, inorganic chemistry, organic chemistry, physical chemistry and industrial chemistry (MS only).

Recipients of the BS in Chemistry, and in some cases the BA, are certified by the American Chemical Society (ACS) if all requirements for professional training of chemists are met. Courses required for ACS certification may be obtained from the department's Undergraduate Affairs Committee.

Bachelor of Science in Chemistry

This degree is designed for students planning for graduate study or positions in the chemical industry.

Degree Requirements

Candidates for the Bachelor of Science in Chemistry must meet the following requirements.

1. **Hours Required and General/College Requirements:** A minimum of 120 semester hours, of which 42 must be advanced, and fulfillment of degree requirements for the Bachelor's degree as specified in the "General University Requirements" in the Academics section of this catalog and the College of Arts and Sciences requirements (excluding foreign language and natural and life sciences). The laboratory science requirement is satisfied only by physical sciences.

2. **Major Requirements:** Minimum of 42 hours, including CHEM 1410/1430 or 1412/1430 or 1413/1430; 1420/1440 or 1422/1440 or 1423/1440; 2370/3210, 2380/3220, 3451/3452, 3510/3230, 3520/3240, 4610/4620 and 4631/4632, plus 6 additional hours at the 4000 level or above (BIOC 4540 to satisfy ACS certification requirements). CHEM 4940 may not be used to meet degree requirements for the chemistry major.

3. **Minor Requirements:** A minor of at least 18 hours in mathematics, computer science, physics, biology or geology (if taken as a laboratory science), of which 6 must be advanced.

4. **Other Course Requirements:** MATH 1710, 1720, 2700, 2730, PHYS 1710/1730 and 2220/2240.

5. **Electives:** See four-year plan.

6. **Other Requirements:** GPA of 2.5 on all advanced courses attempted in science and engineering (biochemistry, biology, chemistry, computer science, engineering, mathematics, physics).

BS in Chemistry

The following four-year plan is one example of a variety of ways in which you can complete your chosen degree in four years, and will serve as guide for you to design your pathway to degree completion. Variations will depend on whether you need to take prerequisites or have college credit from exams or dual enrollment.

The College of Arts and Sciences expects you to have completed the State recommended high school program and be ready to enroll for Language 2040 or a mathematics course above college algebra. If you are not prepared for this level, the necessary prerequisites will either replace electives or increase the hours required for the degree.

FRESHMAN YEAR

FALL	HOURS
CHEM 1410/1430, General Chemistry I and Laboratory, or CHEM 1412/1430, General Chemistry for the Honors College and Laboratory, or CHEM 1413/1430, Honors General Chemistry and Laboratory**	4
ENGL 1310, College Writing I, or ENGL 1313, Computer Assisted College Writing I*	3
MATH 1710, Calculus I**	4
Understanding the Human Community*	3
Total	14

SPRING	HOURS
CHEM 1420/1440, General Chemistry II and Laboratory, or CHEM 1422/1440, General Chemistry for the Honors College and Laboratory, or CHEM 1423/1440, Honors General Chemistry and Laboratory**	4
ENGL 1320, College Writing II, or ENGL 1323, Computer Assisted College Writing II*	3
MATH 1720, Calculus II	3
Social and Behavioral Sciences*	3
Visual and Performing Arts*	3
Total	16

SOPHOMORE YEAR

FALL	HOURS
CHEM 2370/3210, Organic Chemistry and Laboratory	4
HIST 2610, United States History to 1865	3
MATH 2730, Multivariable Calculus	3
Elective (advanced)	3
Humanities*	3
Total	16

SPRING	HOURS
CHEM 2380/3220, Organic Chemistry and Laboratory	4
HIST 2620, United States History Since 1865	3
Minor	3
Understanding the Human Community (advanced)*	3
Total	13

JUNIOR YEAR

FALL	HOURS
CHEM 3451/3452, Quantitative Analysis and Laboratory	4
CHEM 3510/3230, Physical Chemistry and Laboratory	4
MATH 2700, Linear Algebra and Vector Geometry	3
PHYS 1710/1730, Mechanics and Laboratory	4
Total	15

SPRING	HOURS
CHEM 3520/3240, Physical Chemistry and Laboratory	4
PSCI 1040, American Government*	3
Elective (advanced)	3
Minor	3
Minor	3
Total	16

SENIOR YEAR

FALL	HOURS
CHEM 4610, Advanced Inorganic Chemistry	3
CHEM (4000 level) or BIOC 4540, Biochemistry I	3
PHYS 2220/2240, Electricity and Magnetism and Laboratory	4
PSCI 1050, American Government*	3
Minor (advanced)	3
Total	16

SPRING	HOURS
CHEM 4620, Advanced Inorganic Chemistry Laboratory	1
CHEM 4631/4632, Instrumental Analysis and Laboratory	4
CHEM (4000 level)	3
Minor (advanced)	3
Minor	3
Total	14

See the University Core Curriculum section of this catalog for approved list of course options.
See Arts and Sciences requirements section of this catalog for approved list of course options.

Actual degree audits may vary depending on availability of courses in a given semester.
Some courses may require prerequisites not listed.

Students may wish to use opportunities for electives to complete a minor of their choice or secondary education courses for teacher certification.

Bachelor of Arts

Major in Chemistry

The Bachelor of Arts degree with a major in chemistry is designed for students who want a technical degree with liberal arts orientation; for those who want minors in such areas as business administration, economics and education with teacher certification; and for students interested in life and health sciences.

Degree Requirements

1. **Hours Required and General/College Requirements:** A minimum of 120 semester hours, of which 42 must be advanced, and fulfillment of degree requirements for the Bachelor of Arts degree as specified in the "General University Requirements" in the Academics section of this catalog and the College of Arts and Sciences requirements.

2. **Major Requirements:**

Option I Required Courses: Minimum of 31 hours, including CHEM 1410/1430 or 1412/1430 or 1413/1430; 1420/1440 or 1422/1440 or 1423/1440; 2370/3210, 2380/3220, 3230, 3240, 3451/3452, 3510 and 3520, plus 3 additional hours of chemistry at the 4000 level (except CHEM 4940) or BIOC 3621/3622. This option is recommended for those planning to pursue advanced studies in chemistry.

Option II Required Courses: Minimum of 31 hours, including CHEM 1410/1430 or 1413/1430; 1420/1440 or 1423/1440; 2370/3210, 2380/3220, 3230, 3451/3452 and 3510, plus 7 additional hours, which may include BIOC 3621/3622 and any 4000-level chemistry course (except CHEM 4940).

Option III Required Courses: Minimum of 31 hours, including CHEM 1410/1430 or 1413/1430; 1420/1440 or 1423/1440; 2370/3210, 2380/3220, 3451/3452 and 3530, plus 7 additional hours, which may include BIOC 3621/3622 and any 4000-level chemistry course (except 4940).

3. **Other Course Requirements:** MATH 1710 and 1720; PHYS 1410/1430, 1420/1440 or 1510/1530, 1520/1540 or 1710/1730, 2220/2240 (required of all students who expect to take further course work in physics).

4. **Minor:** Optional.

5. **Electives:** See four-year plan.

6. **Other Requirements:** GPA of 2.5 on all advanced courses attempted in science and engineering courses (biochemistry, biology, chemistry, computer science, engineering, mathematics, physics).

BA with a Major in Chemistry

The following four-year plan is one example of a variety of ways in which you can complete your chosen degree in four years, and will serve as guide for you to design your pathway to degree completion. Variations will depend on whether you need to take prerequisites or have college credit from exams or dual enrollment.

The College of Arts and Sciences expects you to have completed the State recommended high school program and be ready to enroll for Language 2040 or a mathematics course above college algebra. If you are not prepared for this level, the necessary prerequisites will either replace electives or increase the hours required for the degree.

FRESHMAN YEAR

FALL	HOURS
CHEM 1410/1430, General Chemistry I and Laboratory, or CHEM 1412/1430, General Chemistry for the Honors College and Laboratory or CHEM 1413/1430, Honors General Chemistry and Laboratory**	4
ENGL 1310, College Writing I, or ENGL 1313, Computer Assisted College Writing I*	3
LANG 2040, Foreign Language (intermediate, may be used to satisfy a portion of the Understanding the Human Community requirement)**	3
MATH 1710, Calculus I	4
Total	14

SPRING	HOURS
CHEM 1420/1440, General Chemistry II and Laboratory, or CHEM 1422/1440, General Chemistry for the Honors College and Laboratory, or CHEM 1423/1440, Honors General Chemistry and Laboratory**	4
ENGL 1320, College Writing II, or ENGL 1323, Computer Assisted College Writing II*	3
LANG 2050, Foreign Language (intermediate, may be used to satisfy a portion of the Understanding the Human Community requirement)**	3
MATH 1720, Calculus II	3
Elective	3
Total	16

SOPHOMORE YEAR

FALL	HOURS
CHEM 2370/3210, Organic Chemistry and Laboratory	4
HIST 2610, United States History to 1865*	3
Elective	3
Humanities*	3
Total	13

SPRING	HOURS
CHEM 2380/3220, Organic Chemistry and Laboratory	4
HIST 2620, United States History since 1865*	3
Visual and Performing Arts*	3
Elective	3
Elective	3
Total	16

JUNIOR YEAR

FALL	HOURS
CHEM 3451/3452, Quantitative Analysis and Laboratory	4
PSCI 1040, American Government*	3
CHEM (advanced, see major requirements)	4
Elective (advanced)	3
Social and Behavioral Sciences*	3
Total	17

SPRING	HOURS
PSCI 1050, American Government*	3
CHEM (advanced, see major requirements)	4
Elective (advanced)	3
Elective (advanced)	3
Elective (advanced)	3
Total	16

SENIOR YEAR

FALL	HOURS
PHYS 1410/1430, General Physics I and Laboratory, or PHYS 1510/1530, General Physics I with Calculus and Laboratory, or PHYS 1710/1730, Mechanics and Laboratory	4
CHEM (4000 level, see major requirements)	3
Elective (advanced)	3
Elective	1
Natural Sciences*	3
Total	14

SPRING	HOURS
PHYS 1420/1440, General Physics II and Laboratory, or PHYS 1520/1540, General Physics II with Calculus and Laboratory, or PHYS 2220/2240, Electricity and Magnetism and Laboratory	4
Elective (advanced)	3
Elective (advanced)	3
Elective (advanced)	4
Total	14

****See the University Core Curriculum section of this catalog for approved list of course options.***
*****See Arts and Sciences degree requirements section of this catalog for approved list of course options.***

Actual degree audits may vary depending on availability of courses in a given semester.
Some courses may require prerequisites not listed.
Students may wish to use opportunities for electives to complete a minor of their choice of secondary education courses for teacher education.

Minor in Chemistry

Recommended minor: CHEM 1410/1430 or 1413/1430; 1420/1440 or 1423/1440; 2370/3210, 2380/3220, plus, 3451/3452, or 3530 or 4670 (plus 1 advanced hour) or BIOC 3621/3622. CHEM 4940 may not be used to meet degree requirements for the chemistry minor.

Minor for Chemical Technicians

Completion of this minor satisfies course requirements for certification as a "Certified Chemical Technician" by the American Institute of Chemists: CHEM 1410/1430 or 1413/1430; CHEM 1420/1440 or 1423/1440; CHEM 2370/3210, 2380/3220 or 3601/3602; CHEM 3451/3452 or 3610; and CHEM 4631/4632.

Teacher Certification

The College of Arts and Sciences encourages students to explore teaching at the secondary level as a career option. The student's academic advisor in the Dean's Office for Undergraduates and Student Advising in GAB, Room 220, can assist students with specific requirements for teacher certification.

Requirements utilizing the BA degree in Chemistry with Certification in Chemistry: CHEM 1410/1430 or 1412/1430 or 1413/1430; CHEM 1420/1440 or 1422/1440 or 1423/1440; CHEM 2370/3210, 2380/3220, 3451/3452; CHEM 3530 or 3510/3230; CHEM 4700, 4900 (Research Experience); 3 hours of approved chemistry; BIOC 3621/3622; PHYS 1510/1530, 1520/1540. Upon completion of this program, students will be prepared to sit for the certification examinations in Chemistry.

Requirements utilizing the BA degree in Chemistry with Certification in Physical Science: CHEM 1410/1430 or 1412/1430 or 1413/1430; CHEM 1420/1440 or 1422/1440 or 1423/1440; CHEM 2370/3210, 2380/3220, 3451/3452; CHEM 3530 or 3510/3230; CHEM 4700, 4900 (Research Experience); 3 hours of approved 4000-level chemistry; BIOC 3621/3622; PHYS 1510/1530 or 1710/1730; PHYS 2220/2240, 3010/3030. Upon completion of this program, students will be prepared to sit for the certification examinations in Physical Science.

See major for additional course work and GPA requirements.

Students must also complete the required 21 hours in upper-level education courses (EDSE 3800, 3830, 4060, 4070, 4108, 4118, 4840) and meet all GPA requirements to apply for state certification. In order to enroll for the first required education course, the student must make application to the certification program in the College of Education in Matthews Hall, Room 105.

All state certification requirements and information on required examinations is available on the web site of the State Board for Educator Certification (SBEC), *www.sbec.state.tx.us*.

Minor in Mathematics and Science Secondary Teaching

Individuals interested in pursuing certification in math or science teaching at the secondary level may wish to pursue a minor through the Teach North Texas program. See "Teach North Texas" in the College of Arts and Sciences section of this catalog.

Certificate in Forensic Science

Advances in technology have created a need for students in basic sciences to apply the tools of technology to a wide variety of criminal investigations. The forensic science program offers a certificate in forensic science for biological sciences and chemistry students. The certificate is designed to enable students in degree programs in biological sciences and chemistry to begin careers in forensic laboratories. Students must complete 19 hours of course work, including CJUS 4360; BIOL 3331, 4240, 4590; CHEM 4351, 4631/4632; and completion of the Forensic Science Aptitude Test offered by the American Board of Criminalistics. Contact the forensic science program office or visit the web site for more information (*www.forensic.unt.edu*).

The Certificate in Forensic Science in conjunction with a Bachelor of Science in Biochemistry, Biology and Chemistry is accredited by the Forensic Science Education Programs Accreditation Commission [410 North 21st Street, Colorado Springs, CO 80904; 719-636-1100].

Graduate Degrees

The department offers degree programs leading to the Master of Science and Doctor of Philosophy. For information, consult the *Graduate Catalog*.

Courses of Instruction

All Courses of Instruction are located in one section at the back of this catalog.

Course and Subject Guide

The "Course and Subject Guide," found in the Courses of Instruction section of this book, serves as a table of contents and provides quick access to subject areas and prefixes.