

# School of Natural Sciences and Mathematics

## Chemistry (B.A., B.S.)

The Chemistry major builds on a base of chemistry, physics, mathematics, and computer science to provide the student the opportunity to develop essential theoretical and practical skills in the subdisciplines of organic, physical, inorganic, analytical, and macromolecular chemistry. Typically, the practice of chemistry in industry deals with the synthesis, analysis, and control of the many materials used in our technological society.

The Chemistry program at UT Dallas is designed to instruct the student in how chemical experiments are performed, how results are interpreted, and through its integrated laboratory sequence, to emphasize the importance of one subdisciplines in solving problems inherent to another. Meeting these goals, the Chemistry program provides the student with the flexibility to enter industry, go on to graduate school, or pursue medical, dental, and other degrees in the health sciences.

## Faculty

**Robert A. Welch Chair in Chemistry; Professor of Chemistry:** Ray H. Baughman, Dennis Smith Jr.

**Cecil and Ida Green Distinguished Chair in Systems Biology; Professor of Chemistry:** A. Dean Sherry

**Distinguished Chair in Natural Sciences and Mathematics; Dean of the School of Natural Sciences and Mathematics:** Bruce M. Novak

**Professors:** Kenneth J. Balkus, Jr., Rockford K. Draper (Biology), Bruce E. Gnade (Electrical Engineering), John P. Ferraris, Inga H. Musselman

**Associate Professors:** Jung-Mo Ahn, Michael C. Biewer, Gregg R. Dieckmann, Warren J. Goux, Steven Nielsen, Paul Pantano, John W. Sibert IV

**Assistant Professors:** Mihaela C. Stefan, Jie Zheng

**Affiliated Professors:** Lee A. Bulla (Biology), Anvar A. Zakhidov (Physics)

**Research Professors:** Gary E. Kiefer, Duck Joo Yang

**Emeritus Professor:** Richard A. Caldwell

**Senior Lecturers:** Sergio Cortes, Sandhya R. Gavva, Claudia Taenzler

## Degrees

The Chemistry major may choose a program leading either to the B.A. or B.S. degree. The latter degree sequence has been approved by the American Chemical Society's Committee on Professional Training.

## B.A. Program

The B.A. program offers the minimum fundamental knowledge required for adequate professional function in a career in chemistry. It is possible that students choosing this option may, through suitable use of unspecified semester credit hours, prepare for careers in areas as varied as chemistry-related businesses, government, medicine and dentistry, secondary school teaching, and even law or politics.

## B.S. Program

The B.S. program provides more intensive training in chemistry for the student who intends either to obtain employment at the bachelor's level in the chemical industry or to pursue graduate study.

## UTeach Option

The [UTeach option](#) may be added to the BA degree in Chemistry. UTeach Dallas Option degree plans are streamlined to allow students to complete both a rigorous Bachelor of Science or Bachelor of Arts degree and all course work for middle or high school teacher certification in four years. Teaching Option degrees require deep content knowledge combined with courses grounded in the latest research on math and science education. While most graduates go on to classroom teaching, UTeach alums are also prepared to enter graduate school and to work in discipline related industry.

## Bachelor of Arts or Bachelor of Science in Chemistry

*Degree Requirements (120 semester credit hours)*

### I. Core Curriculum Requirements<sup>1</sup>: 42 semester credit hours

#### Communication (6 semester credit hours)

3 semester credit hours Communication ([RHET 1302](#))

3 semester credit hours Communication Elective ([NATS 4310](#) or [CHEM 4390](#))<sup>2</sup>

#### Social and Behavioral Sciences (15 semester credit hours)

6 semester credit hours Government ([GOVT 2301](#) and [GOVT 2302](#))

6 semester credit hours American History

3 semester credit hours Social and Behavioral Sciences Elective

#### Humanities and Fine Arts (6 semester credit hours)

3 semester credit hours Fine Arts ([ARTS 1301](#))

3 semester credit hours Humanities ([HUMA 1301](#))

**Mathematics and Quantitative Reasoning (6 semester credit hours)**

6 semester credit hours Calculus ([MATH 2413](#) and [MATH 2414](#) or [MATH 2417](#) and [MATH 2419](#))<sup>2, 3</sup>

**Science (9 semester credit hours)**

Introductory Chemistry ([CHEM 1311](#)/1111, [CHEM 1312](#)/1112, and [CHEM 2401](#))<sup>3</sup>

**II. Major Requirements: B.S. 60 semester credit hours; B.A. 60 semester credit hours**

**Major Preparatory Courses (26-27 semester credit hours beyond the Core Curriculum)**

[CHEM 1111](#) General Chemistry Laboratory I<sup>2, 3</sup>

or [CHEM 1115](#) Honors Freshman Chemistry Laboratory I<sup>2, 3</sup>

[CHEM 1112](#) General Chemistry Laboratory II<sup>2, 3</sup>

or [CHEM 1116](#) Honors Freshman Chemistry Laboratory II<sup>2, 3</sup>

[CHEM 1311](#) General Chemistry I<sup>2, 3</sup>

or [CHEM 1315](#) Honors Freshman Chemistry I<sup>2, 3</sup>

[CHEM 1312](#) General Chemistry II<sup>2, 3</sup>

or [CHEM 1316](#) Honors Freshman Chemistry II<sup>2, 3</sup>

[CHEM 2123](#)<sup>4</sup> Introductory Organic Chemistry Laboratory I

[CHEM 2125](#)<sup>4</sup> Introductory Organic Chemistry Laboratory II

[CHEM 2323](#)<sup>4</sup> Introductory Organic Chemistry I

[CHEM 2325](#)<sup>4</sup> Introductory Organic Chemistry II

[CHEM 2401](#) Introductory Quantitative Methods in Chemistry<sup>2, 3</sup>

*MATH Sequence - Students may choose one of the following sequences:*

I. [MATH 2413](#) Differential Calculus<sup>3</sup>

and [MATH 2414](#) Integral Calculus<sup>3</sup>

and [MATH 2415](#) Calculus of Several Variables

and [MATH 2418](#) Linear Algebra

or [STAT 3332](#) Statistics for Life Sciences

OR

II. [MATH 2417](#) Calculus I<sup>3</sup>

and [MATH 2419](#) Calculus II<sup>3</sup>  
and [MATH 2451](#) Multivariable Calculus with Applications  
and [MATH 2418](#) Linear Algebra  
or [STAT 3332](#) Statistics for Life Sciences

[PHYS 2125](#) Physics Laboratory I  
[PHYS 2126](#) Physics Laboratory II  
[PHYS 2325](#) Mechanics  
[PHYS 2326](#) Electromagnetism and Waves

**Major Core Courses (12 semester credit hours)**

[CHEM 3321](#) Physical Chemistry I  
[CHEM 3471](#) Advanced Chemical Synthesis Laboratory  
[CHEM 3472](#) Instrumental Analysis

**Major Related Courses (B.S. 22 semester credit hours; B.A. 21 semester credit hours)**

**Bachelor of Arts (18 semester credit hours beyond the Core Curriculum)**

[BIOL/CHEM 3361](#) Biochemistry I  
or [CHEM 4335](#) Polymer Chemistry  
[CHEM 3341](#) Inorganic Chemistry I  
or [CHEM 3322](#) Physical Chemistry II

**Guided Electives - 12 semester credit hours**

May be used in (partial) fulfillment of a Second Major, Minor or Teaching Certificate

**Advanced Writing**

[NATS 4310](#) Advanced Writing in the Natural Sciences and Mathematics<sup>2</sup>

**Bachelor of Science (19 semester credit hours beyond the Core Curriculum)**

[CHEM 3322](#) Physical Chemistry II  
[CHEM 3341](#) Inorganic Chemistry I  
[BIOL/CHEM 3361](#) Biochemistry I  
[CHEM 4473](#) Physical Measurements Laboratory  
[CHEM 4390](#) Research and Advanced Writing in Chemistry<sup>2, 5</sup>  
or [CHEM 4399](#) Research and Advanced Writing in Chemistry for Honors Students<sup>2, 5</sup>

[CHEM 4V91](#) (3 semester credit hours) Research in Chemistry<sup>5</sup>

[BIOL/CHEM 3362](#) Biochemistry II

or [CHEM 4335](#) Polymer Chemistry

or [CHEM 4355](#) Computational Modeling

### III. Elective Requirements: 18 semester credit hours

#### Advanced Electives (6 semester credit hours)

These courses must be outside the major and be upper-division and/or have prerequisites.

#### Free Electives (12 semester credit hours)

The plan must include sufficient upper-division credit to total 51 upper-division semester credit hours.

## Bachelor of Arts in Chemistry with UTeach Option

### Degree Requirements (120 semester credit hours)

#### I. Core Curriculum Requirements<sup>1</sup>: 42 semester credit hours

##### Communication (6 semester credit hours)

3 semester credit hours Communication ([RHET 1302](#))

3 semester credit hours Communication Elective ([NATS 4390/NATS 4399](#))<sup>2</sup>

##### Social and Behavioral Sciences (15 semester credit hours)

6 semester credit hours Government ([GOVT 2301](#) and [GOVT 2302](#))

6 semester credit hours American History

3 semester credit hours Social and Behavioral Sciences Elective

##### Humanities and Fine Arts (6 semester credit hours)

3 semester credit hours Fine Arts ([ARTS 1301](#))

3 semester credit hours Humanities ([HUMA 1301](#))

##### Mathematics and Quantitative Reasoning (6 semester credit hours)

6 semester credit hours Calculus ([MATH 2413](#) and [MATH 2414](#) or [MATH 2417](#) and 2419)<sup>2, 3</sup>

##### Science (9 semester credit hours)

Introductory Chemistry ([CHEM 1311](#)/1111, [CHEM 1312](#)/1112, and [CHEM 2401](#))<sup>3</sup>

## II. Major Requirements: 57-59 semester credit hours

### Major Preparatory Courses (28-29 semester credit hours beyond the Core Curriculum)

[CHEM 1111](#) General Chemistry Laboratory I<sup>2, 3</sup>

or [CHEM 1115](#) Honors Freshman Chemistry Laboratory I<sup>2, 3</sup>

[CHEM 1112](#) General Chemistry Laboratory II<sup>2, 3</sup>

or [CHEM 1116](#) Honors Freshman Chemistry Laboratory II<sup>2, 3</sup>

[CHEM 1311](#) General Chemistry I<sup>2, 3</sup>

or [CHEM 1315](#) Honors Freshman Chemistry I<sup>2, 3</sup>

[CHEM 1312](#) General Chemistry II<sup>2, 3</sup>

or [CHEM 1316](#) Honors Freshman Chemistry II<sup>2, 3</sup>

[CHEM 2123](#)<sup>6</sup> Introductory Organic Chemistry Laboratory I

[CHEM 2125](#)<sup>6</sup> Introductory Organic Chemistry Laboratory II

[CHEM 2323](#)<sup>6</sup> Introductory Organic Chemistry I

[CHEM 2325](#)<sup>6</sup> Introductory Organic Chemistry II

[CHEM 2401](#) Introductory Quantitative Methods in Chemistry<sup>2, 3</sup>

*MATH Sequence - Students may choose one of the following sequences:*

I. [MATH 2413](#) Differential Calculus<sup>3</sup>

and [MATH 2414](#) Integral Calculus<sup>3</sup>

and [MATH 2415](#) Calculus of Several Variables

and [MATH 2418](#) Linear Algebra

or [STAT 3332](#) Statistics for Life Sciences

OR

II. [MATH 2417](#) Calculus I<sup>3</sup>

and [MATH 2419](#) Calculus II<sup>3</sup>

and [MATH 2451](#) Multivariable Calculus with Applications

and [MATH 2418](#) Linear Algebra

or [STAT 3332](#) Statistics for Life Sciences

[PHYS 2125](#) Physics Laboratory I

[PHYS 2126](#) Physics Laboratory II

[PHYS 2325](#) Mechanics

[PHYS 2326](#) Electromagnetism and Waves

**Major Core Courses (11 semester credit hours)**

[CHEM 3321](#) Physical Chemistry I

[CHEM 3471](#) Advanced Chemical Synthesis Laboratory

[CHEM 3472](#) Instrumental Analysis

**Major Related Courses (18-19 semester credit hours beyond core curriculum)**

[BIOL/CHEM 3361](#) and [BIOL 3161](#) Biochemistry I

or [CHEM 4335](#) Polymer Chemistry

[CHEM 3341](#) Inorganic Chemistry I

or [CHEM 3322](#) Physical Chemistry II

**Guided Electives (15 semester credit hours)**

UTeach courses will fulfill this requirement.

### III. Elective Requirements: 19-21 semester credit hours

**Advanced Electives (6 semester credit hours)**

These courses must be outside the major and be upper-division and/or have prerequisites.

UTeach courses can fulfill this requirement.

**UTeach Requirements (3 semester credit hours beyond core curriculum, guided electives, and advanced electives)**

[NATS 1141](#) UTeach Step 1

[NATS 1143](#) UTeach Step 2

[NATS 3341](#) Knowing and Learning in Mathematics and Science

[NATS 3343](#) Classroom Interactions

[HIST 3328](#) History and Philosophy of Science and Medicine

[NATS 4390/4399](#) Research Methods<sup>7</sup>

[NATS 4341](#) Project-Based Instruction

[NATS 4694](#) UTeach Student Teaching, 8-12 Science and Mathematics

or [NATS 4696](#) UTeach Student Teaching, 4-8 Science and Mathematics

[NATS 4141](#) UTeach Student Teaching Seminar

## Free Electives (10-12 semester credit hours)

The plan must include sufficient upper-division credit to total 51 upper-division semester credit hours.

## Minor in Chemistry

18 semester credit hours that must include

[BIOL 3161](#) Biochemistry Workshop I

[BIOL/CHEM 3361](#) Biochemistry I

[CHEM 3321](#) Physical Chemistry I

[CHEM 3472](#) Instrumental Analysis

## Fast Track Baccalaureate/Master's Degrees

Undergraduate students at UT Dallas with strong academic records who intend to pursue the M.S. in Chemistry at UT Dallas may apply for a Fast Track plan of study which involves taking selected graduate courses as an upper-level student. After admission to the graduate program, 15 semester credit hours of graduate courses with an earned grade of B or better can be used toward completion of the baccalaureate degree and to satisfy requirements for the master's degree. Interested students should contact the undergraduate advisor well in advance of the junior year to prepare a sequence permitting maximal advantage to be taken of the catalog's regulations (see [catalog.utdallas.edu/2012/undergraduate/policies/graduate-courses](http://catalog.utdallas.edu/2012/undergraduate/policies/graduate-courses)) regarding Undergraduate Registration for Graduate Courses.

1. Curriculum Requirements can be fulfilled by other approved courses from accredited institutions of higher education. The courses listed in parentheses are recommended as the most efficient way to satisfy both Core Curriculum and Major Requirements at UT Dallas.
2. A required Major course that also fulfills Core Curriculum requirements. If semester credit hours are counted in the Core Curriculum, students must complete additional coursework to meet the minimum requirement for graduation. Course selection assistance is available from the undergraduate advisor.
3. Hours above the Core Curriculum requirement are counted as part of the Major Preparatory Courses.
4. Indicates a prerequisite class to be completed before enrolling for upper-division classes.
5. Research in Chemistry (CHEM 4V91), Research and Advanced Writing in Chemistry (CHEM 4390), and Research and Advanced Writing in Chemistry for Honors Students (CHEM 4399) are better defined as a project than a course and constitute an important part of the B.S. degree. The student conducts original research under the supervision of a faculty member, and then must submit a research report which is defended orally. Normally this project will span two or more semesters. A complete set of guidelines is available from the undergraduate advisor.
6. Indicates a prerequisite class to be completed before enrolling for upper division classes.
7. NATS 4390/4399 fulfills Core Communication requirement