School of Natural Sciences and Mathematics

Chemistry (BA, BS)

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; Professors of Chemistry: Ray H. Baughman, Dennis W. 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., Julia Chan, Rockford K. Draper, John P. Ferraris, Bruce E. Gnade, Inga H. Musselman

Professor Emeritus: Richard A. Caldwell

Research Professors: Garry E. Kiefer, Duck Joo (D. J.) Yang

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

Assistant Professors: Jeremiah J. Gassensmith, Jiyong Lee, Ronald A. Smaldone

Senior Lecturers: Sergio Cortes, Sandhya R. Gavva, Jason L. McAfee, Yanping Qin, Amandeep Sra, Claudia Taenzler

Affiliated Faculty: Lee A. Bulla, Yves J. Chabal, Lev D. Gelb, Amy V. Walker, Anvar A. Zakhidov
Degrees

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

BA Program

The BA 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 hours, prepare for careers in areas as varied as chemistry-related businesses, government, medicine and dentistry, secondary school teaching, and even law or politics.

BS Program

The BS 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 coursework 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)\(^1\)

I. Core Curriculum Requirements: 42 semester credit hours\(^2\)

<table>
<thead>
<tr>
<th>Communication: 6 semester credit hours</th>
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<tbody>
<tr>
<td><strong>COMM 1311</strong>  Survey of Oral and Technology-based Communication</td>
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<tr>
<td><strong>RHET 1302</strong>  Rhetoric</td>
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<table>
<thead>
<tr>
<th>Mathematics: 3 semester credit hours</th>
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<tr>
<td><strong>MATH 2417</strong>  Calculus(^3, 4)</td>
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</tbody>
</table>
Life and Physical Sciences: 6 semester credit hours

- **CHEM 1311** General Chemistry I\(^3\)
- or **CHEM 1315** Honors Freshman Chemistry I\(^3\)
- **CHEM 1312** General Chemistry II\(^3\)
- or **CHEM 1316** Honors Freshman Chemistry II\(^3\)

Language, Philosophy and Culture: 3 semester credit hours

Select any 3 semester credit hours from Language, Philosophy and Culture core courses (see advisor)

Creative Arts: 3 semester credit hours

Select any 3 semester credit hours from Creative Arts core courses (see advisor)

American History: 6 semester credit hours

Select any 6 semester credit hours from American History core courses (see advisor)

Government / Political Science: 6 semester credit hours

- **GOVT 2305** American National Government
- **GOVT 2306** State and Local Government

Social and Behavioral Sciences: 3 semester credit hours

Select any 3 semester credit hours from Social and Behavioral Sciences core courses (see advisor)

Component Area Option: 6 semester credit hours

- **MATH 2417** Calculus I\(^3\), \(^4\)
- or **MATH 2413** Differential Calculus\(^3\), \(^4\)
- **MATH 2419** Calculus II\(^3\), \(^4\)
- or **MATH 2414** Integral Calculus\(^3\), \(^4\)
- **PHYS 2125** Physics Laboratory I\(^3\), \(^5\)

II. Major Requirements: BS 60 semester credit hours; BA 60 semester credit hours
Major Preparatory Courses: 28-29 semester credit hours beyond Core Curriculum

**CHEM 1111** General Chemistry Laboratory I
or **CHEM 1115** Honors Freshman Chemistry Laboratory I

**CHEM 1112** General Chemistry Laboratory II
or **CHEM 1116** Honors Freshman Chemistry Laboratory II

**CHEM 1311** General Chemistry I
or **CHEM 1315** Honors Freshman Chemistry I

**CHEM 1312** General Chemistry II
or **CHEM 1316** Honors Freshman Chemistry II

**CHEM 2123** Introductory Organic Chemistry Laboratory I

**CHEM 2125** Introductory Organic Chemistry Laboratory II

**CHEM 2323** Introductory Organic Chemistry I

**CHEM 2325** Introductory Organic Chemistry II

**CHEM 2401** Introductory Quantitative Methods in Chemistry

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

I. **MATH 2413** Differential Calculus
    and **MATH 2414** Integral Calculus
    and **MATH 2415** Calculus of Several Variables
    and **MATH 2418** Linear Algebra
    or **STAT 2332** Statistics for Life Sciences

OR

II. **MATH 2417** Calculus
    and **MATH 2419** Calculus II
    and **MATH 2451** Multivariable Calculus with Applications
    and **MATH 2418** Linear Algebra
    or **STAT 2332** 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: BS 22 semester credit hours; BA 21 semester credit hours**

**Bachelor of Arts: 18 semester credit hours**
- **BIOL 3361** or **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

**Bachelor of Science: 19 semester credit hours beyond Core Curriculum**
- **CHEM 3322** Physical Chemistry II
- **CHEM 3341** Inorganic Chemistry I
- **BIOL 3361** or **CHEM 3361** Biochemistry I
- **CHEM 4473** Physical Measurements Laboratory
- **CHEM 4390** Research and Advanced Writing in Chemistry
  - or **CHEM 4399** Research and Advanced Writing in Chemistry for Honors Students
- **CHEM 4V91** (3 semester credit hours) Research in Chemistry
- **BIOL 3362** or **CHEM 3362** Biochemistry II
  - or **CHEM 4335** Polymer Chemistry
  - or **CHEM 4355** Computational Modeling

**III. Elective Requirements: 18 semester credit hours**
6 semester credit hours must be outside the major and be upper-division and/or have prerequisites. The plan must include sufficient upper-division courses 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: 42 semester credit hours

**Communication:** 6 semester credit hours

- **COMM 1311** Survey of Oral and Technology-based Communication
- **RHET 1302** Rhetoric

**Mathematics:** 3 semester credit hours

- **MATH 2417** Calculus

**Life and Physical Sciences:** 6 semester credit hours

- **CHEM 1311** General Chemistry I
- **CHEM 1312** General Chemistry II

**Language, Philosophy and Culture:** 3 semester credit hours

Select any 3 semester credit hours from Language, Philosophy and Culture core courses (see advisor)

**Creative Arts:** 3 semester credit hours

Select any 3 semester credit hours from Creative Arts core courses (see advisor)

**American History:** 6 semester credit hours

Select any 6 semester credit hours from American History core courses (see advisor)

**Government / Political Science:** 6 semester credit hours

- **GOVT 2305** American National Government
- **GOVT 2306** State and Local Government

**Social and Behavioral Sciences:** 3 semester credit hours

Select any 3 semester credit hours from Social and Behavioral Sciences core courses (see advisor)
advisor)

Component Area Option: 6 semester credit hours

- **MATH 2417** Calculus \( ^3,^4 \)
- **MATH 2419** Calculus II \( ^3,^4 \)
- **PHYS 2125** Physics Laboratory I \( ^3,^5 \)

II. Major Requirements: 57-59 semester credit hours

Major Preparatory Courses: 28-29 semester credit hours beyond Core Curriculum

- **CHEM 1111** General Chemistry Laboratory I
  - or **CHEM 1115** Honors Freshman Chemistry Laboratory I
- **CHEM 1112** General Chemistry Laboratory II
  - or **CHEM 1116** Honors Freshman Chemistry Laboratory II
- **CHEM 1311** General Chemistry I \( ^3 \)
  - or **CHEM 1315** Honors Freshman Chemistry I \( ^3 \)
- **CHEM 1312** General Chemistry II \( ^3 \)
  - or **CHEM 1316** Honors Freshman Chemistry II \( ^3 \)
- **CHEM 2123** Introductory Organic Chemistry Laboratory I \( ^6 \)
- **CHEM 2125** Introductory Organic Chemistry Laboratory II \( ^6 \)
- **CHEM 2323** Introductory Organic Chemistry I \( ^6 \)
- **CHEM 2325** Introductory Organic Chemistry II \( ^6 \)
- **CHEM 2401** Introductory Quantitative Methods in Chemistry

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

I. **MATH 2413** Differential Calculus \( ^3,^4 \)
   - and **MATH 2414** Integral Calculus \( ^3,^4 \)
   - and **MATH 2415** Calculus of Several Variables
   - and **MATH 2418** Linear Algebra
   - or **STAT 2332** Statistics for Life Sciences

OR

II. **MATH 2417** Calculus \( ^3,^4 \)
and MATH 2419 Calculus II\textsuperscript{3, 4}
and MATH 2451 Multivariable Calculus with Applications
and MATH 2418 Linear Algebra
or STAT 2332 Statistics for Life Sciences

PHYS 2125 Physics Laboratory I\textsuperscript{3, 5}
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 3361 or CHEM 3361 Biochemistry I
BIOL 3161 Biochemistry Workshop 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

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 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 Research Methods
NATS 4341 Project-Based Instruction
NATS 4694 UTeach Apprentice Teaching, 8-12 Science and Mathematics
or NATS 4696 UTeach Apprentice Teaching, 4-8 Science and Mathematics
NATS 4141 UTeach Apprentice Student Teaching Seminar

Free Electives: 10-12 semester credit hours

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

Fast Track Baccalaureate/Master's Degrees

Undergraduate students at UT Dallas with strong academic records who intend to pursue the MS 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/2014/undergraduate/policies/graduate-courses) regarding Undergraduate Registration for Graduate Courses.

1. Incoming freshmen must complete and pass UNIV 1010 Freshman Seminar and the corresponding school-related freshman seminar course. Students, including transfer students, who complete their core curriculum at UT Dallas must take UNIV 2020.

2. Curriculum Requirements can be fulfilled by other approved courses from institutions of higher education. The courses listed are recommended as the most efficient way to satisfy both Core Curriculum and Major Requirements at UT Dallas.

3. 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.

4. Three semester credit hours of Calculus are counted to fulfill the Mathematics Core Requirement with the remaining five semester credit hours to be counted under Component Area Option Core.

5. Six semester credit hours of Physics are counted under Science core, and one semester of Physics (PHYS 2125) are counted under Component Area Option core.
6. Indicates a prerequisite class to be completed before enrolling for upper-division classes.

7. 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 BS 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.

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