

School of Natural Sciences and Mathematics

The School of Natural Sciences and Mathematics offers both graduate and undergraduate programs in Biology and Molecular Biology, Chemistry and Biochemistry, Geosciences, Mathematical Sciences, and Physics, and a graduate program in Science Education. Undergraduate and post-baccalaureate programs in teacher certification are administratively housed in the School of Natural Sciences and Mathematics but serve other schools as well.

The undergraduate programs in Biology and Molecular Biology provide a basic foundation in molecular and cell biology to prepare students for graduate studies in biological sciences (B.S.), for professional studies in a wide variety of health-related areas, for secondary school teaching, and for employment as research assistants in pharmaceutical, biotechnology, government, and environmental science laboratories (B.S., B.A.). The undergraduate program in Chemistry provides the fundamental knowledge required for professional participation in chemically oriented industries, for graduate study in chemistry, and for medical or dental studies (B.S.), or for secondary science teaching or ancillary positions (sales, legal, etc.) in the chemical industries (B.A.).

The undergraduate program in Geosciences provides a general scientific background suitable for some careers in business or law, for secondary school teaching (B.A.), or for employment as a professional geologist, or for graduate studies in Geosciences (B.S.).

The undergraduate programs in Mathematical Sciences (B.S.) encompass Mathematics, Statistics, and Applied Mathematics, and are designed so that students can have the opportunity to prepare for employment immediately upon graduation in a broad range of positions in business, industry, government and education - or for continuing with graduate studies in any of these areas.

The undergraduate Physics program offers a basic foundation in classical and modern physics for students interested in professional careers in physics, usually requiring graduate degrees, as well as in related fields, e.g., electrical engineering, medical physics, radiology, lasers, geophysics, computer science (B.S.), or a strong base in physics for students seeking to pursue careers in medicine, patent law, government or industrial laboratories, or secondary school teaching (B.A.).

The School of Natural Sciences and Mathematics also provides opportunities for students to complete Texas Teacher Certification requirements in Biology, Chemistry, Earth Science, Life/Earth Science, Mathematics, and Physics. Students who wish to be certified should consult the Teacher Development Center for specific requirements as soon as possible after formal admission to the University. Further details may be found in the Teacher Education section of the catalog.

Biology (B.A., B.S.) and Molecular Biology (B.S.)

Faculty

Professors: Lee A. Bulla, Santosh D'Mello, Rockford K. Draper, Steven R. Goodman, Donald M. Gray, Betty S. Pace, Lawrence J. Reitzer

Associate Professors: Gail A.M. Breen, John G. Burr, Jeff L. DeJong, Juan E. González, Ernest M. Hannig, Stephen D. Levene, Robert C. Marsh, Dennis L. Miller

Assistant Professors: Tianbing Xia

Professor Emeritus: Hans Bremer, Claud S. Rupert

Senior Lecturers: Vincent P. Cirillo, John Moltz, Scott A. Rippel, Ilya Sapozhnikov

The Biology Program at U.T. Dallas emphasizes the unifying molecular and cellular nature of organisms. At the center of the Biology undergraduate curriculum are the biochemical, genetic, and cell biology concepts and tools used to study the genes of prokaryotes and eukaryotes, to study the proteins and ribonucleic acids (RNA) encoded by these genes, and to study how the expression of these genes is regulated during the development and lifetimes of organisms. Molecular Biology represents a fusion of the four disciplines of biochemistry, biophysics, genetics, and cell biology. Modern biology requires a background in other disciplines such as chemistry, mathematics, physics, and computer sciences. Principles from these disciplines have to be merged to understand and apply new biotechnology and genetic engineering techniques. It is desirable for entering students to have a broad interest and background in the sciences.

Both B.S. and B.A. degrees are offered in Biology at U.T. Dallas; a B.S. degree is offered in Molecular Biology. The B.S. degrees are intended as preparation for scientific careers in biology or careers in the health professions. The B.A. degree is intended as liberal arts biology major with less emphasis on calculus and more free hours for course work in other

disciplines. Each degree in Biology offers a streamlined double major with Business Administration or Crime and Justice Studies. Five-year Fast Track B.S./M.S. Biology and Molecular Biology degree programs are available, and a 7-year accelerated B.S./D.O. degree program is offered together with the UNT Health Science Center at the Fort Worth College of Osteopathic Medicine (UNTHSC/TCOM).

Minors are offered in Biology, Biomolecular Structure, Microbiology, Molecular and Cell Biology, and Neurobiology.

Transfer Students

Students transferring into Biology or Molecular Biology at the junior level in either the B.S. or the B.A. programs are expected to have completed courses equivalent to:

- Introductory Biology with lab, BIOL 2311, 2312, and 2281
- General Chemistry with lab, CHEM 1311, 1111, 1312, and 1112
- Organic Chemistry with lab, CHEM 2323, 2123, 2325, and 2125
- Calculus, MATH 2417 and 2419 (B.S. or B.A. degree); or Applied Calculus, MATH 1325, (B.A. degree only)
- Physics with lab, calculus-based PHYS 2325, 2125, 2326 and 2126 (B.S. or B.A. degree); or algebra-based PHYS 1301, 1101, 1302, 1102 (B.A. degree only).

Junior-level transfer students deficient in these lower-division requirements may satisfy the requirements with courses taken at U.T. Dallas; however, students deficient in the biology and chemistry requirements may be delayed in entering upper-division biology courses.

Bachelor of Arts or Bachelor of Science in Biology Degree Requirements (124 hours)

I. Core Curriculum Requirements¹: 42 hours

- A. Communication (6 hours)
 - 3 hours Communication (RHET 1302)
 - 3 hours Communication Elective (BIOL 4337, BIOL 4390, BIOL 4399 or NATS 4310)²
- B. Social and Behavioral Sciences (15 hours)
 - 6 hours Government (GOVT 2301 and 2302)
 - 6 hours American History
 - 3 hours Social and Behavior Sciences Elective
- C. Humanities and Fine Arts (6 hours)
 - 3 hours Fine Arts (ARTS 1301)
 - 3 hours Humanities (HUMA 1301)
- D. Mathematics and Quantitative Reasoning (6 hours)
 - 6 hours Calculus (MATH 2417 and 2419) - BA or BS³
 - or Applied Calculus and Statistics for Life Sciences (MATH 1325 and STAT 3332) -BA only
- E. Science (9 hours)
 - 9 hours Chemistry (CHEM 1311/1111, 1312/1112 and 2123)

¹ Curriculum Requirements can be fulfilled by other approved courses from accredited institutions of higher education. The courses listed in parenthesis are recommended as the most efficient way to satisfy both Core Curriculum and Major requirements at UT Dallas.

II. Major Requirements: 53 - 61 hours (53-55, B.A.; 61, B.S.)

- Major Preparatory Courses (16-18 hours beyond Core Curriculum)
 - CHEM 1311/1111, 1312/ 1112 General Chemistry I and II with Laboratory
 - CHEM 2323*/2123* and 2325/2125 Introductory Organic Chemistry I and II with Laboratory
 - MATH 2417 and 2419 Calculus I and II (BA or BS)
 - or MATH 1325 Applied Calculus I
 - and STAT 3332 Statistics for Life Sciences (BA only)
 - PHYS 3341/2125 Physics for BioScience I with Laboratory (BA or BS)
 - or PHYS 1301/1101 College Physics I with Laboratory (BA only)
 - PHYS 3342/2126 Physics for BioScience II with Laboratory (BA or BS)
 - or PHYS 1302/1102 College Physics II with Laboratory (BA only)
- Major Core Courses (29-32 hours)

BIOL 2281* Introductory Biology Laboratory
 BIOL 2111* Introduction to Modern Biology Workshop
 BIOL 2112* Introduction to Modern Biology Workshop II
 BIOL 2311* Introduction to Modern Biology I
 BIOL 2312* Introduction to Modern Biology II
 BIOL 3101 Classical and Molecular Genetics Workshop
 BIOL 3102 Eukaryotic Molecular and Cell Biology Workshop
 BIOL 3161 Biochemistry Workshop I
 BIOL 3162 Biochemistry Workshop II
 BIOL 3301 Classical and Molecular Genetics
 BIOL 3302 Eukaryotic Molecular and Cell Biology
 BIOL 3361 Biochemistry I
 BIOL 3362 Biochemistry II
 or BIOL 3335 Microbial Physiology
 BIOL 3380 Biochemistry Laboratory
 BIOL 4380 Cell and Molecular Biology Laboratory (BS only)
 Major Related Courses (9-12 hours)⁴
 9 hours upper-division BIOL electives (BA only)
 12 hours upper-division BIOL electives (BS only)

² Biology majors may choose BIOL 4337, BIOL 4390, BIOL 4399 or NATS 4310 or another approved Biology elective to fulfill the Core Curriculum Communication Elective.

³ Six hours of Calculus are counted under Mathematics Core, and 2 hours of Calculus are counted as Major Preparatory Courses.

⁴ Up to 3 hours of individual instruction may be used in fulfilling this requirement.

* Indicates a prerequisite class to be completed before enrolling for upper-division classes.

III. **Elective Requirements: 21 - 29 hours**

Advanced Electives

All students are required to take at least six hours of advanced electives outside their major field of study. These must be either upper-division classes or lower-division classes that have prerequisites. These may be satisfied with CHEM 2323 and 2325, counted under Major Preparatory Courses.

Free Electives (21 hours for BS; 27-29 hours for BA)

All students must complete at least 51 hours of upper-division credit to graduate.

Bachelor of Science in Molecular Biology Degree Requirements (129 hours)

I. **Core Curriculum Requirements¹: 41 hours**

- A. Communication (6 hours)
 - 3 hours Communication (RHET 1302)
 - 3 hours Communication Elective (BIOL 4337, BIOL 4390, BIOL 4399 or NATS 4310)²
- B. Social and Behavioral Sciences (15 hours)
 - 6 hours Government (GOVT 2301 and 2302)
 - 6 hours American History
 - 3 hours Social and Behavior Sciences Elective
- C. Humanities and Fine Arts (6 hours)
 - 3 hours Fine Arts (ARTS 1301)
 - 3 hours Humanities (HUMA 1301)
- D. Mathematics and Quantitative Reasoning (6 hours)
 - 6 hours Calculus (MATH 2417 and 2419)³
- E. Science (9 hours)
 - 9 hours Chemistry (CHEM 1311/1111, 1312/1112 and 2123)

¹ Curriculum Requirements can be fulfilled by other approved courses from accredited institutions of higher education. The courses listed in parenthesis are recommended as the most efficient way to satisfy both Core Curriculum and Major requirements at UT Dallas.

II. **Major Requirements: 68-69 hours**

Major Preparatory Courses (20-21 hours beyond Core Curriculum)

CHEM 1111 General Chemistry Laboratory I
 CHEM 1112 General Chemistry Laboratory II
 CHEM 1311 General Chemistry I
 CHEM 1312 General 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
 MATH 2417 Calculus I
 MATH 2419 Calculus II
 MATH 2451 Multivariable Calculus with Applications
 or STAT 3332 Statistics for Life Sciences
 PHYS 2125 Physics Laboratory I
 PHYS 2126 Physics Laboratory II
 PHYS 3341 Physics for BioScience I
 PHYS 3342 Physics for BioScience II
 Major Core Courses (36 hours)
 BIOL 2111* Introduction to Modern Biology Workshop I
 BIOL 2112* Introduction to Modern Biology Workshop II
 BIOL 2281* Introductory Biology Laboratory
 BIOL 2311* Introduction to Modern Biology I
 BIOL 2312* Introduction to Modern Biology II
 BIOL 3101 Classical and Molecular Genetics Workshop
 BIOL 3102 Eukaryotic Molecular and Cell Biology Workshop
 BIOL 3161 Biochemistry Workshop I
 BIOL 3162 Biochemistry Workshop II
 BIOL 3301 Classical and Molecular Genetics
 BIOL 3302 Eukaryotic Molecular and Cell Biology
 BIOL 3361 Biochemistry I
 BIOL 3362 Biochemistry II
 or BIOL 3335 Microbial Physiology
 BIOL 3380 Biochemistry Laboratory
 BIOL 4380 Cell & Molecular Biology Laboratory
 or BIOL 3V96 (3 hours) Undergraduate Research in Molecular and Cell Biology⁴
 or BIOL 4399 (3 hours) Senior Honors Research and Thesis
 BIOL 4461 Biophysical Chemistry
 Major Related Courses (12 hours)⁵
 12 hours upper-division approved molecular biology-related BIOL or CHEM electives

² Molecular Biology majors may choose BIOL 4337, BIOL 4390, BIOL 4399, NATS 4310 or another approved Biology elective to fulfill the Core Curriculum Communication Elective.

³ Six hours of Calculus are counted under Mathematics Core, and 2 hours of Calculus are counted as Major Preparatory Courses.

⁴ These substitutes for BIOL 4380 require permission of the Biology Undergraduate Advisor to ensure equivalent training in recombinant DNA analysis.

⁵ Up to 6 hours of research may be used in fulfilling the major related course requirement.

* Indicates a prerequisite class to be completed before enrolling for upper-division classes.

III. Elective Requirements: 18-19 hours

Advanced Electives

All students are required to take at least six hours of advanced electives outside their major field of study. These must be either upper-division classes or lower-division classes that have prerequisites. These may be satisfied with CHEM 2323 and 2325, counted under Major Preparatory Courses.

Free Electives (18-19 hours)

All students must complete at least 51 hours of upper-division credit to graduate.

Bachelor of Arts or Bachelor of Science in Biology and Business Administration Degree Requirements (Double Major - 134-136 hours)

I. Core Curriculum Requirements!: 42 hours

- A. Communication (6 hours)
 - 3 hours Communication (RHET 1302)
 - 3 hours Communication Elective (BA 4305)²
- B. Social and Behavioral Sciences (15 hours)
 - 6 hours Government (GOVT 2301 and 2302)
 - 6 hours American History
 - 3 hours Social and Behavior Sciences Elective (ECO 2301)²
- C. Humanities and Fine Arts (6 hours)
 - 3 hours Fine Arts (ARTS 1301)
 - 3 hours Humanities (HUMA 1301)
- D. Mathematics and Quantitative Reasoning (6 hours)
 - 6 hours Calculus (MATH 2417 and 2419)³ - BA or BS
 - or Applied Calculus (MATH 1325 and 1326) - BA only
- E. Science (9 hours)
 - 9 hours Chemistry (CHEM 1311/1111, 1312/1112 and 2123)

¹ Curriculum Requirements can be fulfilled by other approved courses from accredited institutions of higher education. The courses listed in parenthesis are recommended as the most efficient way to satisfy both Core Curriculum and Major requirements at UT Dallas.

II. Major Requirements: 80-82 hours

Biology Major Preparatory Courses (15-17 hours beyond Core Curriculum)

- CHEM 1111 General Chemistry Laboratory I
- CHEM 1112 General Chemistry Laboratory II
- CHEM 1311 General Chemistry I
- CHEM 1312 General 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
- MATH 2417 and 2419³ Calculus I and II (BA or BS)
- or MATH 1325 and 1326 Applied Calculus I and II (BA only)
- PHYS 3341/2125 Physics for BioScience I with Laboratory (BA or BS)
- or PHYS 1301/1101 College Physics I with Laboratory (BA only)
- PHYS 3342/2126 Physics for BioScience II with Laboratory (BA or BS)
- or PHYS 1302/1102 College Physics II with Laboratory (BA only)

Biology Major Core Courses (29 hours)

- BIOL 2111* Introduction to Modern Biology Workshop I
- BIOL 2112* Introduction to Modern Biology Workshop II
- BIOL 2281* Introductory Biology Laboratory
- BIOL 2311* Introduction to Modern Biology I
- BIOL 2312* Introduction to Modern Biology II
- BIOL 3101 Classical and Molecular Genetics Workshop
- BIOL 3102 Eukaryotic Molecular and Cell Biology Workshop
- BIOL 3161 Biochemistry Workshop I
- BIOL 3162 Biochemistry Workshop II
- BIOL 3301 Classical and Molecular Genetics
- BIOL 3302 Eukaryotic Molecular and Cell Biology
- BIOL 3361 Biochemistry I
- BIOL 3362 Biochemistry II
- or BIOL 3335 Microbial Physiology
- BIOL 3380 Biochemistry Laboratory

Business Administration Major Preparatory Courses (15 hours beyond Core Curriculum)

- AIM 2301* Introductory Financial Accounting
- AIM 2302* Introductory Management Accounting
- BA 2301* Business and Public Law
- ECO 2301* Principles of Macroeconomics²
- ECO 2302* Principles of Microeconomics

MATH 2333* Matrices, Vectors and Their Application
Business Administration Core Courses (21 hours)
BA 3341 Business Finance
BA 3351 Introduction to Management Information Systems
BA 3352 Production Management
BA 3361 Organizational Behavior
BA 3365 Marketing Management
BA 4305 Social & Political Environment of Business²
BA 4371 International Business
STAT 3360 Probability and Statistics for Management and Economics
or STAT 3332 Statistics for Life Sciences

² A required Major course that also fulfills a Core Curriculum requirement. Hours are counted in Core Curriculum.

³ Six hours of Calculus are counted under Mathematics Core, and 2 hours of Calculus are counted as Major Preparatory Courses.

* Indicates a prerequisite class to be completed before enrolling for upper-division classes.

III. Elective Requirements: 12 hours

Advanced Electives

All students are required to take at least six hours of advanced electives outside their major field of study. These must be either upper-division classes or lower-division classes that have prerequisites. These may be satisfied with CHEM 2323 and 2325, counted under Major Preparatory Courses.

Guided Electives (12 hours)

Business Administration (9 hours): To be selected from AIM and BA courses.

Biology (3 hours): BIOL 4380 Cell and Molecular Biology Laboratory (must be taken for the Biology elective in BS only). All students must complete at least 51 hours of upper-division credit to graduate.

Bachelor of Science in Molecular Biology and Business Administration Degree Requirements (Double Major – 140 hours)

I. Core Curriculum Requirements!: 42 hours

A. Communication (6 hours)

3 hours Communication (RHET 1302)

3 hours Communication Elective (BA 4305)²

B. Social and Behavioral Sciences (15 hours)

6 hours Government (GOVT 2301 and 2302)

6 hours American History

3 hours Social and Behavior Sciences Elective (ECO 2301)²

C. Humanities and Fine Arts (6 hours)

3 hours Fine Arts (ARTS 1301)

3 hours Humanities (HUMA 1301)

D. Mathematics and Quantitative Reasoning (6 hours)

6 hours Calculus (MATH 2417 and 2419)³

E. Science (9 hours)

9 hours Chemistry (CHEM 1311/1111, 1312/1112 and 2123)

¹ Curriculum Requirements can be fulfilled by other approved courses from accredited institutions of higher education. The courses listed in parenthesis are recommended as the most efficient way to satisfy both Core Curriculum and Major requirements at UT Dallas.

II. Major Requirements: 86 hours

Biology Major Preparatory Courses (17 hours beyond Core Curriculum)

CHEM 1111 General Chemistry Laboratory I

CHEM 1112 General Chemistry Laboratory II

CHEM 1311 General Chemistry I

CHEM 1312 General 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
 MATH 2417 Calculus I ³
 MATH 2419 Calculus II ³
 PHYS 3341/2125 Physics for BioScience I with Laboratory
 PHYS 3342/2126 Physics for BioScience II with Laboratory
 Biology Major Core Courses (33 hours)
 BIOL 2111* Introduction to Modern Biology Workshop I
 BIOL 2112* Introduction to Modern Biology Workshop II
 BIOL 2281* Introductory Biology Laboratory
 BIOL 2311* Introduction to Modern Biology I
 BIOL 2312* Introduction to Modern Biology II
 BIOL 3101 Classical and Molecular Genetics Workshop
 BIOL 3102 Eukaryotic Molecular and Cell Biology Workshop
 BIOL 3161 Biochemistry Workshop I
 BIOL 3162 Biochemistry Workshop II
 BIOL 3301 Classical and Molecular Genetics
 BIOL 3302 Eukaryotic Molecular and Cell Biology
 BIOL 3361 Biochemistry I
 BIOL 3362 Biochemistry II
 or BIOL 3335 Microbial Physiology
 BIOL 3380 Biochemistry Laboratory
 BIOL 4461 Biophysical Chemistry
 Business Administration Major Preparatory Courses (15 hours beyond Core Curriculum)
 AIM 2301* Introductory Financial Accounting
 AIM 2302* Introductory Management Accounting
 BA 2301* Business and Public Law
 ECO 2301* Principles of Macroeconomics²
 ECO 2302* Principles of Microeconomics
 MATH 2333* Matrices, Vectors and Their Application
 Business Administration Core Courses (21 hours)
 BA 3341 Business Finance
 BA 3351 Introduction to Management Information Systems
 BA 3352 Production Management
 BA 3361 Organizational Behavior
 BA 3365 Principles of Marketing
 BA 4305 Strategic Management ²
 BA 4371 International Business
 STAT 3360 Probability and Statistics for Management and Economics
 or STAT 3332 Statistics for Life Sciences

² A required Major course that also fulfills a Core Curriculum requirement. Hours are counted in Core Curriculum.

³ Six hours of Calculus are counted under Mathematics Core, and 2 hours of Calculus are counted as Major Preparatory Courses.

* Indicates a prerequisite class to be completed before enrolling for upper-division classes.

III. Elective Requirements: 12 hours

Advanced Electives

All students are required to take at least six hours of advanced electives outside their major field of study. These must be either upper-division classes or lower-division classes that have prerequisites. These may be satisfied with CHEM 2323 and 2325, counted under Major Preparatory Courses.

Guided Electives (12 hours)

Business Administration (9 hours): To be selected from AIM and BA courses.

Biology (3 hours): To be selected from BIOL 4380, BIOL 3V96 (3 hours)⁴ and BIOL 4399 (3 hours)⁴

All students must complete at least 51 hours of upper-division credit to graduate.

⁴ Requires permission of the Biology Undergraduate Advisor to ensure training in recombinant DNA analysis.

Bachelor of Arts or Bachelor of Science in Biology and Crime and Justice Studies Degree Requirements (Double Major – **128122-130-124** hours)

I. **Core Curriculum Requirements¹: 42 hours**

- A. Communication (6 hours)
 - 3 hours Communication (RHET 1302)
 - 3 hours Communication Elective (BIOL 4337, BIOL 4390, BIOL 4399, CJS 3300, or NATS 4310)²
- B. Social and Behavioral Sciences (15 hours)
 - 6 hours Government (GOVT 2301 and 2302)
 - 6 hours American History
 - 3 hours Social and Behavior Sciences Elective (ECO 2301 or 2302)³
- C. Humanities and Fine Arts (6 hours)
 - 3 hours Fine Arts (ARTS 1301)
 - 3 hours Humanities (HUMA 1301)
- D. Mathematics and Quantitative Reasoning (6 hours)
 - 6 hours Calculus (MATH 2417 and 2419)⁴ – BA or BS
 - or Applied Calculus (MATH 1325) and either Statistics for Life Sciences (STAT 3332) or Social Statistics with Laboratory (SOCS 3305/3105) – BA only
- E. Science (9 hours)
 - 9 hours Chemistry (CHEM 1311/1111, 1312/1112 and 2123)

¹ Curriculum Requirements can be fulfilled by other approved courses from accredited institutions of higher education. The courses listed in parenthesis are recommended as the most efficient way to satisfy both Core Curriculum and Major requirements at UT Dallas.

II. **Major Requirements: 68-70 hours**

Biology Major Preparatory Courses (15-17 hours beyond Core Curriculum)

- CHEM 1111 General Chemistry Laboratory I
- CHEM 1112 General Chemistry Laboratory II
- CHEM 1311 General Chemistry I
- CHEM 1312 General 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
- MATH 2417 and 2419³ Calculus I and II (BA or BS)
- or MATH 1325 Applied Calculus I
- and either STAT 3332 Statistics for Life Sciences
- or SOCS 3305/3105 Social Statistics with Laboratory (BA only)
- PHYS 3341/2125 Physics for BioScience I with Laboratory (BA or BS)
- or PHYS 1301/1101 College Physics I with Laboratory (BA only)
- PHYS 3342/2126 Physics for BioScience II with Laboratory (BA or BS)
- or PHYS 1302/1102 College Physics II with Laboratory (BA only)

Biology Major Core Courses (32 hours)

- BIOL 2111* Introduction to Modern Biology Workshop I
- BIOL 2112* Introduction to Modern Biology Workshop II
- BIOL 2281* Introductory Biology Laboratory
- BIOL 2311* Introduction to Modern Biology I
- BIOL 2312* Introduction to Modern Biology II
- BIOL 3101 Classical and Molecular Genetics Workshop
- BIOL 3102 Eukaryotic Molecular and Cell Biology Workshop
- BIOL 3161 Biochemistry Workshop I
- BIOL 3162 Biochemistry Workshop II
- or BIOL 3335 Microbial Physiology
- BIOL 3301 Classical and Molecular Genetics
- BIOL 3302 Eukaryotic Molecular and Cell Biology
- BIOL 3318 Forensic Biology
- BIOL 3361 Biochemistry I
- BIOL 3362 Biochemistry II

BIOL 3380 Biochemistry Laboratory
 Crime and Justice Studies Major Preparatory Course (No hours beyond Core Curriculum)
 ECO 2301 Principles of Macroeconomics
 or ECO 2302 Principles of Microeconomics³
 Crime and Justice Studies Core Courses (18 hours)
 CJS 3300 Crime and Civil Liberties
 CJS 3301 Theories of Justice
 or another Social Science course with a distributive justice emphasis such as SOC 4361 Law and Society, or ECO
 4320 Public Sector Economics
 CJS 3302 Advanced Criminology
 CJS 3303 Advanced Criminal Justice
 CJS 3304 Research Methods in Crime and Justice Studies
 CJS 3319 Comparative Justice Systems
 CJS 4305 Social Control and Criminal Sanctions
 CJS 4321 Senior Research Seminar

² Double majors may choose BIOL 4337, BIOL 4390, BIOL 4399, CJS 3301, GOVT 3325, NATS 4310 or another approved Biology elective to fulfill the Core Curriculum Communication Elective.

³ A required Major course that also fulfills a Core Curriculum requirement. Hours are counted in Core Curriculum.

⁴ Six hours of Calculus are counted under Mathematics Core, and 2 hours of Calculus are counted as Major Preparatory Courses.

* Indicates a prerequisite class to be completed before enrolling for upper-division classes.

III. **Elective Requirements: 15 hours**

Advanced Electives

All students are required to take at least six hours of advanced electives outside their major field of study. These must be either upper-division classes or lower-division classes that have prerequisites. These may be satisfied with CHEM 2323 and 2325, counted under Major Preparatory Courses.

Guided Electives (15 hours)

Biology (6 hours): BIOL 4380 Cell and Molecular Biology Laboratory (must be taken for one of the Biology electives in BS only).

Crime and Justice Studies and Related Electives (9 hours): All students must complete at least 51 hours of upper-division credit to graduate.

Bachelor of Science in Molecular Biology and Crime and Justice Studies Degree Requirements (Double Major – ~~134128-135-129~~ hours)

I. **Core Curriculum Requirements¹: 42 hours**

A. Communication (6 hours)

3 hours Communication (RHET 1302)

3 hours Communication Elective (BIOL 4337, BIOL 4390, BIOL 4399, CJS 3300, or NATS 4310)²

B. Social and Behavioral Sciences (15 hours)

6 hours Government (GOVT 2301 and 2302)

6 hours American History

3 hours Social and Behavior Sciences Elective (ECO 2301 or 2302)³

C. Humanities and Fine Arts (6 hours)

3 hours Fine Arts (ARTS 1301)

3 hours Humanities (HUMA 1301)

D. Mathematics and Quantitative Reasoning (6 hours)

6 hours Calculus (MATH 2417 and 2419)⁴

E. Science (9 hours)

9 hours Chemistry (CHEM 1311/1111, 1312/1112 and 2123)

¹ Curriculum Requirements can be fulfilled by other approved courses from accredited institutions of higher education. The courses listed in parenthesis are recommended as the most efficient way to satisfy both Core Curriculum and Major requirements at UT Dallas.

II. **Major Requirements: 77-78 hours**

Biology Major Preparatory Courses (20-21 hours beyond Core Curriculum)

CHEM 1111 General Chemistry Laboratory I

CHEM 1112 General Chemistry Laboratory II
 CHEM 1311 General Chemistry I
 CHEM 1312 General 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
 MATH 2417 Calculus I ³
 MATH 2419 Calculus II ³
 MATH 2451 Multivariable Calculus with Applications
 or STAT 3332 Statistics for Life Sciences
 or SOCS 3305/3105 Social Statistics with Laboratory
 PHYS 3341/2125 Physics for BioScience I with Laboratory
 PHYS 3342/2126 Physics for BioScience II with Laboratory
 Biology Major Core Courses (36 hours)
 BIOL 2111* Introduction to Modern Biology Workshop I
 BIOL 2112* Introduction to Modern Biology Workshop II
 BIOL 2281* Introductory Biology Laboratory
 BIOL 2311* Introduction to Modern Biology I
 BIOL 2312* Introduction to Modern Biology II
 BIOL 3101 Classical and Molecular Genetics Workshop
 BIOL 3102 Eukaryotic Molecular and Cell Biology Workshop
 BIOL 3161 Biochemistry Workshop I
 BIOL 3162 Biochemistry Workshop II
 BIOL 3301 Classical and Molecular Genetics
 BIOL 3302 Eukaryotic Molecular and Cell Biology
 BIOL 3318 Forensic Biology
 BIOL 3361 Biochemistry I
 BIOL 3362 Biochemistry II
 or BIOL 3335 Microbial Physiology
 BIOL 3380 Biochemistry Laboratory
 BIOL 4461 Biophysical Chemistry
 Crime and Justice Studies Major Preparatory Course (No hours beyond Core Curriculum)
 ECO 2301 Principles of Macroeconomics
 or ECO 2302 Principles of Microeconomics³
 Crime and Justice Studies Core Courses (18 hours)
 CJS 3300 Crime and Civil Liberties
 CJS 3301 Theories of Justice
 or another Social Science course with a distributive justice emphasis such as SOC 4361 Law and Society, or ECO
 4320 Public Sector Economics
 CJS 3302 Advanced Criminology
 CJS 3303 Advanced Criminal Justice
 CJS 3304 Research Methods in Crime and Justice Studies
 CJS 3319 Comparative Justice Systems
 CJS 4305 Social Control and Criminal Sanctions
 CJS 4321 Senior Research Seminar

² Double majors may choose BIOL 4337, BIOL 4390, BIOL 4399, CJS 3301, GOVT 3325, NATS 4310 or another approved Biology elective to fulfill the Core Curriculum Communication Elective.

³ A required Major course that also fulfills a Core Curriculum requirement. Hours are counted in Core Curriculum.

⁴ Six hours of Calculus are counted under Mathematics Core, and 2 hours of Calculus are counted as Major Preparatory Courses.

* Indicates a prerequisite class to be completed before enrolling for upper-division classes.

III. **Elective Requirements: 12 hours**

Advanced Electives

All students are required to take at least six hours of advanced electives outside their major field of study. These must be either upper-division classes or lower-division classes that have prerequisites. These may be satisfied with CHEM 2323 and 2325, counted under Major Preparatory Courses.

Guided Electives (12 hours)

Crime and Justice Studies and Related Electives (9 hours): All students must complete at least 51 hours of upper-division credit to graduate.

Biology (3 hours): To be selected from BIOL 4380, BIOL 3V96 (3 hours)⁵ and BIOL 4399 (3 hours)⁵
All students must complete at least 51 hours of upper-division credit to graduate.

⁵ Requires permission of the Biology Undergraduate Advisor to ensure training in recombinant DNA analysis.

Minor in Biology

Course Requirements: 18 hours

BIOL 2311/2111 Introduction to Modern Biology I with Workshop

BIOL 3301/3101 Classical and Molecular Genetics with Workshop

BIOL 3361/3161 Biochemistry I with Workshop

Two BIOL electives for majors

Minor in Biomolecular Structure

Course Requirements: 18 hours

BIOL 3336 Protein and Nucleic Acid Structure

BIOL/CHEM 4461 Biophysical Chemistry, unless taken to fulfill the Molecular Biology major requirements

BIOL 4261 Biomolecular Modeling

CHEM 2323 and 2325 Introductory Organic Chemistry I and II

One to two approved BIOL, CHEM, CS, EE, MATH, or PHYS electives

Minor in Molecular and Cell Biology

Course Requirements: 18 hours

CHEM 2323 and 2325 Introductory Organic Chemistry I and II

Four approved molecular and cell biology electives

Minor in Microbiology

Course Requirements: 18 hours

BIOL 3V20 General Microbiology with Laboratory¹

BIOL 3335 Microbial Physiology²

BIOL 4350 Medical Microbiology

or BIOL 4316 Parasites and Symbionts

BIOL 4345 Immunobiology

CHEM 2323 Introductory Organic Chemistry I

One approved microbiology elective

¹ Two hrs of BIOL 3V20 may be used to satisfy the Cell and Molecular Biology Laboratory core requirement for Biology and Molecular Biology majors.

² May be substituted with CHEM 2325 Introductory Chemistry II if used to satisfy the Biochemistry II core requirement for Biology and Molecular Biology majors.

Minor in Neurobiology

Course Requirements: 18 hours

BIOL 4370 Developmental Neurobiology

BIOL 3371 Biology of the Brain

or NSC 4352 Cellular Neuroscience

CHEM 2323 and 2325 Introductory Organic Chemistry I and II

NSC 4353 Neuroscience Laboratory Methods

NSC 4354 Integrative Neuroscience

Fast Track Baccalaureate/Master's Degrees

U.T. Dallas undergraduate students with strong academic records, including at least 15 hours of upper-division Biology core courses, who intend to pursue graduate work in Biology at U.T. Dallas, may apply for the Fast Track which involves taking selected graduate courses as an upper-division student. After admission to the graduate program, 15 hours of graduate courses with an earned grade of B or better can be used toward completion of the B.S. and to satisfy requirements for those courses at the graduate level. This program provides an opportunity to obtain the B.S. degree in Biology after 124 hours of work and an M.S. degree in Molecular and Cell Biology after an additional 27 hours of graduate course and research work. Interested students should contact the Biology undergraduate advisor well in advance of the senior year to prepare a degree plan taking maximal advantage of this 5-year Fast Track program.

The 7-Year B.S. /D.O. Dual Degree Program

The Biology Program has recently developed an accelerated program that, in conjunction with the UNT Health Science Center at Fort Worth College of Osteopathic Medicine (UNTHSC/TCOM), would provide Biology majors the opportunity to earn both a Bachelor of Science degree from U.T. Dallas and a Doctor of Osteopathic Medicine degree in 7 years. Students enrolled in the program would take regular biology core courses at U.T. Dallas for the first three years and apply for admission to TCOM. However, progress towards the completion of a B.S. in Biology at U.T. Dallas does not ensure that the student will be admitted into TCOM. U.T. Dallas students in this program do not receive any special considerations from TCOM during the application process and must be accepted based upon their merit while at U.T. Dallas. After acceptance into TCOM, the student will spend the fourth year taking courses for credit towards a D.O. degree at TCOM. Once the student has successfully completed the first year at TCOM, the student will receive a Bachelor of Science degree in Biology from U.T. Dallas. Students interested in this program should contact the Biology undergraduate advisor or program coordinator.

Degree Planning

Upper-division biology courses taken at other institutions may be included as part of the degree plan subject to the provisions of the section on Transfer Admissions.

Major-related courses may not include more than 9 hours (B.S.) or 6 hours (B.A.) of upper-division transfer credit and not more than 3 hours (Biology major) or 6 hours (Molecular Biology major) of individual instruction (e.g., BIOL 3V90, BIOL 3V91, BIOL 3V92, BIOL 3V95, BIOL 3V96, BIOL 4302, BIOL 4390, or BIOL 4399).

Students planning a career in a particular allied health profession should consult the school they expect to attend to apprise themselves of the course requirements for admission.

Admission standards for medical and dental schools are set by the individual professional school, whose specific requirements should be reviewed with the help of the U.T. Dallas Health Professions Education Advisors. Most professional schools prefer that admission applications be channeled through the Health Professions Education Office.

Biochemistry (B.S.)

The Biochemistry program at U.T. Dallas, administered through the Department of Chemistry, draws on faculty from the Departments of Chemistry, Molecular and Cell Biology, and researchers from U.T. Southwestern Medical School to provide courses and research opportunities to its majors. The Biochemistry major bridges the gap between modern Chemistry and Biology. The curriculum, designed to prepare students for either graduate work in the Biological Sciences, the Chemical Sciences, or for entry-level positions in the biotechnology industry, builds on a base of biology, chemistry, physics, and mathematics to provide the student the opportunity to develop essential theoretical and practical skills.

Faculty

Chemistry:

Distinguished Scholar in Residence: Alan G. MacDiarmid

Robert A. Welch Chair in Chemistry: Ray H. Baughman

Cecil and Ida Green Chair in Chemistry: A. Dean Sherry

Professors: Kenneth J. Balkus, Jr., Richard A. Caldwell, Rockford K. Draper (Biology), John P. Ferraris, Bruce E. Gnade (Electrical Engineering), Lynn A. Melton

Associate Professors: Michael C. Biewer, Warren J. Goux, Inga H. Musselman, Paul Pantano

Assistant Professors: Jung-Mo Ahn, Gregg Dieckmann, Donovan C. Haines, Steven Nielsen, John W. Sibert IV

Senior Lecturers: Sergio Cortes, Sandhya R. Gawwa

Molecular and Cell Biology:

Professors: Lee A. Bulla, Rockford K. Draper, Donald M. Gray, Franklyn G. Jenifer, Lawrence J. Reitzer, Ronald E. Yasbin

Associate Professors: Gail A.M. Breen, John G. Burr, Jeff L. Dejong, Santosh R. D'Mello, Ernest M. Hannig, Stephen D. Levene, Robert C. Marsh, Dennis L. Miller

Assistant Professors: Juan E. González, Matthew Junker

Senior Lecturers: Vincent P. Cirillo, John Moltz, Scott A. Rippel, Joseph Wood

U.T. Southwestern Medical School:

UTD Biochemistry majors may perform their research in the laboratories of faculty members from the departments of Biochemistry, Internal Medicine, Pharmacology and Physiology at U.T. Southwestern, as available.

Bachelor of Science in Biochemistry Degree Requirements (B.S. 129 hours)

I. Core Curriculum Requirements¹: 42 hours

- A. Communication (6 hours)
 - 3 hours Communication (RHET 1302)
 - 1 hour Oral Communication (RHET 1101)
 - 3 hours Communication Elective (Satisfied by BIOL/CHEM 3V92)²
- B. Social and Behavioral Sciences (15 hours)
 - 6 hours Government (GOVT 2301 and 2302)
 - 6 hours American History
 - 3 hours Social and Behavioral Sciences Elective
- C. Humanities and Fine Arts (6 hours)
 - 3 hours Fine Arts (ARTS 1301)
 - 3 hours Humanities (HUMA 1301)
- D. Mathematics and Quantitative Reasoning (6 hours)³
 - 6 hours Calculus (MATH 2417 and 2419)^{2, 3}
- E. Science (9 hours)
 - Introductory Chemistry (CHEM 1311/1111, 1312/1112, and 2401)³

II. Major Requirements:

- Major Preparatory Courses (29 hours beyond core curriculum)
 - BIOL 2111 Introduction to Modern Biology Workshop I
 - BIOL 2311 Introduction to Modern Biology I
 - CHEM 1111 General Chemistry Laboratory I ^{2, 3}
 - CHEM 1112 General Chemistry Laboratory II ^{2, 3}
 - CHEM 1311 General Chemistry I ^{2, 3}
 - CHEM 1312 General Chemistry II ^{2, 3}
 - 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 ^{2, 3}
 - MATH 2417 Calculus ^P
 - MATH 2419 Calculus II³
 - MATH 2451 Multivariable Calculus with Applications
 - PHYS 2125 Physics Laboratory I
 - PHYS 2126 Physics Laboratory II

PHYS 2325 Mechanics
or PHYS 3341 Physics for Bioscience I
PHYS 2326 Electromagnetism and Wave s
or PHYS 3342 Physics for Bioscience II

Major Core Courses (40 hours beyond core curriculum)

BIOL 3101 Classical and Molecular Genetics Workshop
BIOL 3102 Eukaryotic Molecular and Cell Biology Workshop
BIOL 3161 Biochemistry Workshop I
BIOL 3162 Biochemistry Workshop II
BIOL 3301 Classical and Molecular Genetics
BIOL 3302 Eukaryotic Molecular and Cell Biology
BIOL 3380 Biochemistry Laboratory
BIOL/CHEM 3361 Biochemistry I
BIOL/CHEM 3362 Biochemistry II
BIOL/CHEM 3V92 (6 hours) Undergraduate Research in Biochemistry (includes Advanced Writing)^{2,4}
CHEM 3321 Physical Chemistry I
CHEM 3322 Physical Chemistry II
CHEM 3472 Instrumental Analysis
Any two upper-division Chemistry or Biology electives (6 hours) not taken to fulfill above.

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 U.T. Dallas.

² A required Major course that also fulfills Core Curriculum requirements. If 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 Research in Biochemistry (BIOL/CHEM 3V92) is better defined as a project than a course and constitutes an important part of the B. S. degree. The student conducts original research under the supervision of a faculty member, then must submit a research report which is defended orally in an undergraduate research symposium during the spring semester of their senior year. Normally this project will span two or more semesters.

* Indicates a prerequisite class to be completed before enrolling for upper-division classes.

III. Elective Requirements: 18 hours

Advanced Electives (6 hours)

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

Free Electives (12 hours)

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

STAT 3332 Statistics for Life Sciences is strongly recommended.

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 U.T. 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 subdiscipline 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

Distinguished Scholar in Residence: Alan G. MacDiarmid

Robert A. Welch Chair in Chemistry: Ray H. Baughman

Cecil and Ida Green Chair in Chemistry: A. Dean Sherry

Professors: Kenneth J. Balkus, Jr., Ray H. Baughman, Richard A. Caldwell, Rockford K. Draper (Biology), John P. Ferraris, Bruce Gnade (Electrical Engineering), Lynn A. Melton

Associate Professors: Michael C. Biewer, Warren J. Goux, Inga H. Musselman, Paul Pantano

Assistant Professors: Jung-Mo Ahn, Gregg R. Dieckmann, Donovan C. Haines, Steven Nielsen, John W. Sibert IV

Senior Lecturers: Sergio Cortes, Sandhya R. Gava
Affiliated Professors: Lee A. Bula (Biology), Anvar A. Zakhidov (Physics)
Research Professors: D.J. Yang
Research Associate Professors: Sanjeev K. Manohar

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 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.

Bachelor of Arts or Bachelor of Science in Chemistry Degree Requirements (B.S. 122 hours; B.A. 121 hours)

I. Core Curriculum Requirements!: 42 hours

- A. Communication (6 hours)
 - 3 hours Communication (RHET 1302)
 - 3 hours Communication Elective (NATS 4310)²
- B. Social and Behavioral Sciences (15 hours)
 - 6 hours Government (GOVT 2301 and 2302)
 - 6 hours American History
 - 3 hours Social and Behavioral Sciences Elective
- C. Humanities and Fine Arts (6 hours)
 - 3 hours Fine Arts (ARTS 1301)
 - 3 hours Humanities (HUMA 1301)
- D. Mathematics and Quantitative Reasoning (6 hours)
 - 6 hours Calculus (MATH 2417 and 2419)^{2, 3}
- E. Science (9 hours)
 - Introductory Chemistry (CHEM 1311/1111, 1312/1112, and 2401)³

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 U.T. Dallas.

II. Major Requirements: B.S. 57 hours; B.A. 56 hours

- Major Preparatory Courses (29 hours beyond the Core Curriculum)
 - CHEM 1111+ General Chemistry Laboratory I^{2, 3}
 - CHEM 1112+ General Chemistry Laboratory II^{2, 3}
 - CHEM 1311+ General Chemistry I^{2, 3}
 - CHEM 1312+ General Chemistry II^{2, 3}
 - 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^{2, 3}
 - MATH 2417 Calculus I³

MATH 2418 Linear Algebra
or STAT 3332 Statistics for Life Sciences
MATH 2419 Calculus II³
MATH 2451 Multivariable Calculus with Applications
PHYS 2125 Physics Laboratory I
PHYS 2126 Physics Laboratory II
PHYS 2325 Mechanics
PHYS 2326 Electromagnetism and Waves

Major Core Courses (12 hours)

CHEM 3321 Physical Chemistry I
CHEM 3471 Advanced Chemical Synthesis Laboratory
CHEM 3472 Instrumental Analysis

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

Bachelor of Arts (18 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 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 Mathematics²

Bachelor of Science (19 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 4V91 (6 hours) Research in Chemistry (includes Advanced Writing)^{2,4}
CHEM 3362 Biochemistry II
or CHEM 4335 Polymer Chemistry
or CHEM 4355 Computational Modeling

² A required Major course that also fulfills Core Curriculum requirements. If 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 Research in Chemistry (CHEM 4V91) is better defined as a project than a course and constitutes an important part of the B. S. degree. The student conducts original research under the supervision of a faculty member, 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.

⁺ Indicates course requirements satisfied upon successful completion of the Honors Chemistry Sequence 1315+ 1115+1316+ 1116

^{*} Indicates a prerequisite class to be completed before enrolling for upper division classes.

III. Elective Requirements: 18 hours

Advanced Electives (6 hours)

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

Free Electives (12 hours)

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

Minor in Chemistry

18 hours that must include

BIOL 3161 Biochemistry I Workshop
BIOL/CHEM 3361 Biochemistry I
CHEM 3321 Physical Chemistry I
CHEM 3472 Instrumental Analysis

Fast Track Baccalaureate/Master's Degrees

Undergraduate students at U.T. Dallas with strong academic records who intend to pursue the M.S. in Chemistry at U.T. 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 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 **page xx**) regarding Undergraduate Registration for Graduate Courses.

Geosciences (B.A., B.S.)

Attaining greater understanding of past and present Earth processes is the fundamental goal of geosciences. To achieve this goal the geoscientist studies the minerals, rocks, fluids, and fossils of the Earth and investigates the physical, chemical, and biological processes occurring on and in the Earth.

Professional opportunities in geology exist in the environmental, energy, and mineral resources industries and in government agencies concerned with these fields. In addition, many occupations concerned with law, management, economics, and the environment utilize a background in geosciences.

Specific degree plans will be formulated by the undergraduate advisor in Geosciences. Changing circumstances may require changes to the degree plans.

Faculty

Professors: Carlos L. V. Aiken, William I. Manton, George A. McMechan, Richard M. Mitterer, Dean C. Presnall, Robert H. Rutford, Robert J. Stern

Associate Professors: Thomas H. Brikowski, James L. Carter, John F. Ferguson

Assistant Professor: Mohamed G. Abdel-Salam, Matthew I. Leybourne

Professor Emeritus: David E. Dunn, Anton L. Hales

Bachelor of Arts in Geosciences* Degree Requirements (120 hours)

I. Core Curriculum Requirements¹: 42 hours

- A. Communication (6 hours)
 - 3 hours Communication (RHET 1302)
 - 3 hours Communication Elective (NATS 4310)²
- B. Social and Behavioral Sciences (15 hours)
 - 6 hours Government (GOVT 2301 and 2302)
 - 6 hours American History
 - 3 hours Social and Behavioral Sciences Elective
- C. Humanities and Fine Arts (6 hours)
 - 3 hours Fine Arts (ARTS 1301)
 - 3 hours Humanities (HUMA 1301)
- D. Mathematics and Quantitative Reasoning (6 hours)
 - 6 hours College Mathematics (See Associate Dean for recommended courses)
- E. Science (9 hours)
 - 8 hours of Chemistry, Biology or Physics, including laboratory component
 - 1 hour Geosciences Laboratory (GEOS 1103)

II. Major Requirements: 50 hours

- Major Preparatory Courses (15 hours)
 - GEOS 1104 History of Earth and Life Laboratory
 - GEOS 1303 Physical Geology
 - GEOS 1304 History of Earth and Life
 - GEOS 2406 Geospatial Science and Methods
 - GEOS 2409 Rocks and Minerals
- Major Core Courses (8 hours)

GEOS 3421 Stratigraphy and Sedimentology
GEOS 3434 Paleobiology
Major Related Courses (27 hours)
Geosciences electives (15 hours)
Science electives (12 hours)
Advanced Writing (3 hours)
NATS 4310² Advanced Writing in the Natural Sciences and Mathematics

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 U.T. Dallas.

² A Major requirement that also fulfills a Core Curriculum requirement. If hours are counted in the Core Curriculum, students must complete additional coursework to meet the minimum requirements for graduation. Course selection assistance is available from the undergraduate advisor.

* Must be taken in conjunction with a second major.

III. **Elective Requirements: 28 hours**

Advanced Electives (6 hours)

All students are required to take at least six hours of advanced electives outside their major field of study. These must be either upper-division classes or lower-division classes that have prerequisites.

Free Electives (22 hours)

Both lower- and upper-division courses may count as electives, but students must complete at least 51 hours of upper-division credit to qualify for graduation.

Bachelor of Science in Geosciences Degree Requirements (120 hours)

I. **Core Curriculum Requirements¹: 49 hours**

A. Communication (6 hours)

3 hours Communication (RHET 1302)

3 hours Communication Elective (NATS 4310)²

B. Social and Behavioral Sciences (15 hours)

6 hours Government (GOVT 2301 and 2302)

6 hours American History

3 hours Social and Behavioral Sciences Elective

C. Humanities and Fine Arts (6 hours)

3 hours Fine Arts (ARTS 1301)

3 hours Humanities (HUMA 1301)

D. Mathematics and Quantitative Reasoning (6 hours; 2 hours extra may be counted as free electives)

Calculus (MATH 2417 and 2419)

E. Science (9 hours)

8 hours Chemistry (CHEM 1311/1111 and 1312/1112)

8 hour Physics (PHYS 2125, 2126, 2325, and 2326)

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 U.T. Dallas.

² A Major requirement that also fulfills a Core Curriculum requirement. If hours are counted in the Core Curriculum, students must complete additional coursework to meet the minimum requirements for graduation. Course selection assistance is available from the undergraduate advisor.

II. **Major Requirements: 60 hours**

A. Major Preparatory Courses (12 hours) Pre-requisite courses to be completed before enrolling in upper-division GEOS courses.

GEOS 1103 Physical Geology Laboratory

GEOS 1104 History of Earth and Life Laboratory

GEOS 1303 Physical Geology

GEOS 1304 History of Earth and Life

GEOS 2409 Rocks and Minerals*

B. Major Core Courses (39 hours)

GEOS 2406 Geospatial Science and Methods
GEOS 3421 Stratigraphy and Sedimentology
GEOS 3434 Paleobiology
GEOS 3464 Mineralogy and Petrography
GEOS 3470 Structural Geology
GEOS 4320 The Physics and Chemistry of the Solid Earth
GEOS 4322 Earth System
GEOS 4430 Hydrogeology and Aqueous Geochemistry
GEOS 4606 Field Geology (Summer Field Camp)

A mathematics course selected from:

GEOS 5306 Data Analysis for Geoscientists (with permission)
MATH 2418 Linear Algebra
MATH 2451 Multivariable Calculus with Applications
MATH 4332 Scientific Math Computing

III. Elective Requirements: 21 hours

A. Advanced Electives (6 hours)

All students are required to take at least six hours of advanced electives outside their major field of study. These must be either upper-division classes or lower-division classes that have prerequisites.

B. Free Electives (15 hours)

Both lower- and upper-division courses may count as electives, but students must complete at least 51 hours of upper-division credit to qualify for graduation. Students are strongly encouraged to take GEOS graduate courses as free electives.

Fast Track Baccalaureate/Master's Degrees

The Fast-Track program allows students with strong academic records to take selected graduate courses that may be applied toward the baccalaureate degree and be used to satisfy requirements for the master's degree. Interested students who intend to pursue a master's degree in Geosciences may apply for a Fast Track baccalaureate/master's plan of study via the Geosciences graduate advisor. The planned coursework must be coordinated with the Geosciences undergraduate advisor; the Geosciences graduate advisor should also be notified. A maximum of 15 credit hours may be applied under this program.

Geosciences Minor

Students not majoring in Geosciences are encouraged to choose Geosciences as a minor.

Lower-division courses (8 hours):

GEOS 1103 Physical Geology Laboratory *
GEOS 1104 History of Earth and Life Laboratory*
GEOS 1303 Physical Geology *
GEOS 1304 History of Earth and Life *

Upper-division courses (12 hours): To be selected in consultation with Geosciences Undergraduate advisor

*A prerequisite course to be completed before enrolling in upper-division GEOS courses.

Mathematical Sciences (B.S.)

Mathematics is both a profession and an indispensable tool for many types of work. As a tool, mathematics is a universal language which has been crucial in formulating and expressing ideas not only in science and engineering, but also in many other areas such as business and the social sciences. As probably the oldest and most basic science, it provides the key to understanding the major technological achievements of our time.

Of equal importance, knowledge of mathematics may help provide a student with the type of uncompromising and clear-sighted thinking useful in considering the problems of many other disciplines. The Mathematical Sciences degree program encompasses mathematics, statistics, and applied mathematics.

Applied mathematics and statistics continue to enjoy a rapid growth. Students have the opportunity of applying their expertise to any of a number of fields of application. For the student to be more effective in such applications, Mathematical

Sciences also offers degree programs allowing additional emphasis in the areas of actuarial science, computer science, electrical engineering, and management.

Those interested in obtaining both a B.S. in Mathematical Sciences and Teacher Certification in the state of Texas should consult the Office of Teacher Education for specific requirements as soon as possible after formal admission to the University. See the Teacher Education section of this catalog for additional information.

The Mathematical Sciences degree program also prepares students for graduate studies. An accelerated B.S./M.S. Fast-Track program is available which provides the opportunity for undergraduate students to satisfy some of the requirements of the master's degree while they are completing the bachelor's degree in Mathematical Sciences.

Faculty

Professors: Larry P. Ammann, M. Ali Hooshyar, Patrick L. Odell (Emeritus), Istvan Ozsvath, Ivor Robinson (Emeritus), Robert Serfling, Janos Turi, John W. Van Ness (Emeritus), John Wiorkowski

Associate Professor: Michael I. Baron

Assistant Professor: Pankaj Choudhary, Mieczyslaw Dabkowski

Affiliated Faculty: Titu Andreescu, Thomas Butts (Science and Mathematics Education)

Senior Lecturers: Frank R. Allum, William Donnell, Bentley Garrett, Yuly Koshevnik, Grigory Kramer, David L. Lewis, Joanna R. Robinson, William Scott, Paul Stanford, H. Edward Stone

The Options

Students seeking a degree in the Mathematical Sciences may specialize in Mathematics, Statistics, or Applied Mathematics. Each option allows some flexibility in electives so that students can better adapt their degree plans to their educational goals.

Mathematics: For students interested in a career in mathematics and for students interested in continuing on to graduate work in mathematics, applied mathematics, math education, and related areas.

Statistics: For students interested in probability and statistical models and their use in data analysis and decision making and for students interested in continuing on to graduate work in statistics, biostatistics, actuarial science, and other statistics-related areas.

Applied Mathematics: For students interested in mathematics for the purpose of using it broadly in various areas of application and for students interested in continuing on to graduate work in applied mathematics and related areas.

Fast Track Baccalaureate/Master's Degrees

For students interested in pursuing graduate studies in Mathematical Sciences, the Mathematics Department offers an accelerated B.S./M.S. Fast Track that involves taking graduate courses instead of several advanced undergraduate courses. Acceptance into the Fast Track is based on the student's attaining a GPA of at least 3.20 in all mathematics classes and being within 30 hours of graduation. Fast Track students may, during their senior year, take 15 graduate hours which may be used to complete the baccalaureate degree. After admission to the graduate program, these 15 graduate hours may also satisfy requirements for the master's degree. Fast Track programs are offered in math, applied math, and statistics.

Bachelor of Science in Mathematical Sciences Degree Requirements (120 hours)

I. Core Curriculum Requirements¹: 42 hours

- A. Communication (6 hours)
 - 3 hours Communication (RHET 1302)
 - 3 hours Communication Elective (NATS 4310)²
- B. Social and Behavioral Sciences (15 hours)
 - 6 hours Government (GOVT 2301 and 2302)
 - 6 hours American History

- 3 hours Social and Behavioral Sciences Elective
- C. Humanities and Fine Arts (6 hours)
 - 3 hours Fine Arts (ARTS 1301)
 - 3 hours Humanities (HUMA 1301)
- D. Mathematics and Quantitative Reasoning (6 hours)
 - 6 hours Calculus (MATH 2417 and 2419)³
- E. Science (9 hours)
 - Math/Applied Math Options
 - PHYS 2125 Physics Laboratory I
 - PHYS 2126 Physics Laboratory II
 - PHYS 2325 Mechanics
 - PHYS 2326 Electromagnetism and Waves
 - And an additional acceptable science course
 - Statistics Option
 - PHYS 2325/2125 Mechanics with Laboratory and PHYS 2326/2126 Electromagnetism and Waves with Laboratory or CHEM 1311/1111 and 1312/1112 General Chemistry I and II with Laboratory
 - And an additional acceptable science course

¹ Curriculum Requirements can be fulfilled by other approved courses from accredited institutions of higher education. The courses listed in parenthesis are recommended as the most efficient way to satisfy both Core Curriculum and Major Requirements at U. T. Dallas.

II. Major Requirements: 48 hours

Major Preparatory Courses (15 hours)

- CS 1337* Computer Science I
- MATH 2417 Calculus³
- MATH 2418* Linear Algebra
- MATH 2419 Calculus II³
- MATH 2420* Differential Equations with Applications
- MATH 2451* Multivariable Calculus with Applications

Major Core Courses (21 hours)

- MATH 3310 Theoretical Concepts of Calculus
- MATH 3311 Abstract Algebra I
- MATH 3379 Complex Variables
- MATH 4301 Mathematical Analysis I
- MATH 4302 Mathematical Analysis II
- MATH 4334 Numerical Analysis
- NATS 4310 Advanced Writing in the Natural Sciences and Mathematics²
- STAT 4351 Probability

Major Related Courses (12 hours)

Applied Math Option

- MATH 4341 Topology
- MATH 4355 Methods of Applied Mathematics
- MATH 4362 Partial Differential Equations
- STAT 4382 Stochastic Processes

Mathematics Option

- MATH 3312 Abstract Algebra II
- MATH 3321 Geometry
- MATH 4341 Topology
- 3 hours upper-division guided elective⁴

Statistics Option

- STAT 3355 Data Analysis for Statisticians and Actuaries
- STAT 4352 Mathematical Statistics
- STAT 4382 Stochastic Processes
- 3 hour upper-division guided elective⁴

² A Major course requirement that also fulfills a Core Curriculum requirement. If hours are counted in the Core Curriculum, students must complete additional coursework to meet the minimum requirements for graduation. Course selection assistance is available from the undergraduate advisor.

³ Two hours of Calculus are counted as electives; six hours are counted in Core Curriculum.

⁴ Approval of Mathematical Science department advisor required.

* Indicates a prerequisite class to be completed before enrolling in upper-division classes.

III. Elective Requirements: 30 hours

Advanced Electives (6 hours)

All students are required to take at least six hours of advanced electives outside their major field of study. These must be either upper-division classes or lower-division classes that have prerequisites.

Free Electives (24 hours)

Both lower- and upper-division courses may count as electives, but the student must complete at least 51 hours of upper-division credit to qualify for graduation.

Mathematical Sciences Options with Actuarial Science Emphasis

Statistics Option together with following courses:

AIM 2301 Introductory Financial Accounting
BA 3341 Business Finance
BA 3351 Introduction to Management Information Systems
BA 4345 Money and Capital Markets
BA 4346 Investment Management
STAT 4372 Actuarial Science

And any two of the following courses:

AIM 2302 Introductory Management Accounting
AIM 3331 Intermediate Financial Accounting I
BA 4347 Applied Corporate Finance
ECO 4330 Law and Economics

Notes: AIM 2301 must be taken before BA 3341, 4345, 4346 and 4347.

MATH 1325 or MATH 2417 relates to Exam 100 of Society of Actuaries (SOA) and Exam 1A of the Casualty Actuarial Society (CAS) and MATH 4334 relates to Exam 135 of SOA.

STAT 4351 and STAT 4352 relate to Exam 110 of SOA and Exam 1B of CAS. STAT 3355 and STAT 4382 relate to Exam 120 of SOA and Exams 3F, 3G, 4A, 4B, 4C of CAS. STAT 4372 relates to Exams 3E, 3H and the rest of Exam 4 of CAS and Exam 150 of SOA.

Mathematical Sciences Options with Computer Science Emphasis

Applied Mathematics Option or Statistics Option together with following courses:

CS 2305 Discrete Mathematics for Computing I
CS 2336 Computer Science II
CS 3305 Discrete Mathematics for Computing II
CS 3335 C and C++
CS 3345 Data Structures and Introduction to Algorithmic Analysis
CS 4337 Organization of Programming Languages
CS 4340 Computer Architecture

Mathematical Sciences Options with Electrical Engineering Emphasis

Applied Mathematics Option or Statistics Option together with following courses:

EE 3101 Electrical Network Analysis Laboratory
EE 3111 Electronic Circuits Laboratory
EE 3120 Digital Circuits Laboratory
EE 3301 Electrical Network Analysis
EE 3311 Electronic Circuits
EE 3320 Digital Circuits
EE 4301 Electromagnetic Engineering I

Mathematical Sciences Options with Management Emphasis

Mathematics Option, Applied Mathematics Option or Statistics Option together with following courses:

AIM 2301 Introductory Financial Accounting
AIM 2302 Introductory Management Accounting
BA 2301 Business and Public Law
BA 3341 Business Finance
BA 3351 Introduction to Management Information Systems

BA 3361 Organizational Behavior

NOTE: Students transferring into Mathematical Sciences at the upper-division level are expected to have completed all of the 1000- and 2000- level mathematics core course requirements.

Minor in Mathematical Sciences

Students not majoring in Mathematical Sciences may obtain a minor in Mathematics or Statistics by satisfying the following requirements:

18 credit hours of mathematics or statistics, 12 hours of which must be chosen from the following courses:

Mathematics Minor: MATH 3310, MATH 4334 and two more upper-division mathematics courses that satisfy degree

requirements by students in Mathematical Sciences.

Statistics Minor: STAT 4351, STAT 4352 and two more upper-division mathematics courses that satisfy degree requirements by students in Mathematical Sciences.

Physics (B.A., B.S.)

The science of physics seeks understanding of the behavior of matter and energy at the most general and fundamental level. The physicist is trained to explore the physical universe in which people live and seeks interpretations of the natural phenomena found there. While much is known about the physical universe, many phenomena still remain to be investigated, understood, and exploited to the ultimate benefit of humankind. This is the challenge that a modern physicist faces.

Faculty

Distinguished Scholar in Residence: Alan G. MacDiarmid

Cecil and Ida Green Chair in Physics: Roderick A. Heelis

Professors: Roy C. Chaney, Carl B. Collins, Jr., Austin J. Cunningham, Da Hsuan Feng, Ervin J. Fenyves, Robert Glosser, John H. Hoffman, Joseph M. Izen, Francis S. Johnson (Emeritus), Xinchou Lou, Wolfgang A. Rindler, Brian A. Tinsley, Robert H. Wallace (Electrical Engineering), B. Hobson Wildenthal, Anvar A. Zakhidov

Associate Professors: Phillip Anderson, Gregory D. Earle, Yuri Gartstein

Assistant Professors: Mustapha Ishak-Boushaki

Senior Lecturers: Paul MacAlevey, Bea Rasmussen

Affiliated Faculty: Dale Byrne (Engineering), Cyrus D. Cantrell (Engineering), John Ferraris (Chemistry), Mary Urquhart (Science/Math Ed.)

The Degrees

The student majoring in Physics must meet the general university requirements for admission and for the specific degree the student is seeking. The Physics Program offers both the Bachelor of Arts and the Bachelor of Science degrees.

Bachelor of Science

The Bachelor of Science is intended for students interested in a professional career in physics or closely related fields. Fifty-six hours of physics, eight hours of chemistry and 16 hours of mathematics are included in the 122 credit hours required for the degree.

Bachelor of Arts

The Bachelor of Arts program provides an opportunity for a strong base in physics for students wishing to pursue graduate studies (non-physics) in, for example, medicine, business administration, biophysics, oceanography, and patent or high technology law. Additionally, students seeking certification as high school teachers with physics as a major specialization and those seeking employment in industry, government service, and computer technology have the opportunity to obtain the necessary physics background through this program. The lower-division course requirements for the B.A. degree are the

same as those for the B.S. degree. At the upper-division level, 26 hours of physics and 15 hours of science electives are required, making a total of 122 credit hours.

Graduate Studies Track

The recommended course of study toward a Bachelor of Science degree for those students who intend to pursue graduate studies in Physics begins with a two-semester Honors sequence of fundamentals of physics that gives the student a more extensive foundation in basic physics. The remainder of the program is the same as the regular B.S. program. A total of 122 credit hours is required.

Algebra Based Physics

An algebra based general physics course (PHYS 1301, 1302) with lab (PHYS 1101, 1102) is offered for students interested in the health sciences and those curious about the physical world in which we live. It stresses understanding the workings of nature and the physical processes and phenomena occurring therein.

Minor in Physics (20 hours)

A minor is offered that consists of PHYS 2325/2125 and 2326/2126, 3311, 3352 and two other upper-division physics courses.

Fast Track Baccalaureate/Master's Degrees

For students interested in pursuing graduate studies in physics, the Physics Department offers an accelerated B.S. /M.S. Fast Track that involves taking graduate courses in lieu of several advanced undergraduate courses. Acceptance into the Fast Track is based on the student's attaining a GPA of at least 3.00 on a minimum of 30 hours of upper-division courses that include PHYS 3311, 3312, 3330, 3416 and 3352. Eligible students may take up to 15 credit hours of selected graduate courses that may be used to complete the baccalaureate degree and also satisfy requirements for the master's degree. These credits will partially satisfy the M.S. degree requirements when the student completes the B.S. degree. Interested students should contact their advisor during their junior year to apply to the Fast Track program.

Bachelor of Arts in Physics Degree Requirements (122 hours)

I. Core Curriculum Requirements¹: 42 hours

- A. Communication (6 hours)
 - 3 hours Communication (RHET 1302)
 - 3 hours Communication Elective
- B. Social and Behavioral Sciences (15 hours)
 - 6 hours Government (GOVT 2301 and 2302)
 - 6 hours American History
 - 3 hours Social and Behavioral Sciences Elective
- C. Humanities and Fine Arts (6 hours)
 - 3 hours Fine Arts (ARTS 1301)
 - 3 hours Humanities (HUMA 1301)
- D. Mathematics and Quantitative Reasoning (6 hours)
 - 6 hours Calculus (MATH 2417 and 2419)³
- E. Science (9 hours)
 - 8 hours Chemistry (CHEM 1311/1111, 1312/1112)³
 - 1 hour Physics (PHYS 2125)³

¹ Curriculum Requirements can be fulfilled by other approved courses from accredited institutions of higher education. The courses listed in parenthesis are recommended as the most efficient way to satisfy both Core Curriculum and Major Requirements at U.T. Dallas.

II. Major Requirements: 62 hours

- Major Preparatory Courses (21 hours)

- MATH 2417 Calculus I²
- MATH 2419 Calculus II²
- MATH 2420 Differential Equations with Applications*
- MATH 2451 Multivariable Calculus with Applications*
- PHYS 1100 Fun of Physics
- PHYS 2303 Contemporary Physics*
- PHYS 2325/2125 Mechanics with Recitation/Laboratory*
 - or PHYS 2421/2125 Honors Physics I Mechanics and Heat with Recitation/Laboratory*
- PHYS 2326/2126 Electromagnetism and Waves with Recitation/Laboratory*
 - or PHYS 2422/2126 Honors Physics II Electromagnetism and Waves with Recitation/Laboratory*
- Major Core Courses (26 hours)
 - PHYS 3125 Electronics Laboratory
 - PHYS 3311 Theoretical Physics
 - PHYS 3312 Classical Mechanics
 - PHYS 3325 Electronics
 - PHYS 3330 Numerical Methods in Physics and Computational Techniques
 - PHYS 3352 Modern Physics I
 - PHYS 3416 Electricity and Magnetism
 - PHYS 4311 Thermodynamics and Statistical Mechanics
 - PHYS 4373 Physical Measurements Laboratory
- Major Related Courses (15 hours)
 - 15 hours Science Electives
 - Advanced Writing
 - PHYS 4399 Senior Honors in Physics
 - or NATS 4310 Advanced Writing in the Natural Sciences and Mathematics
 - or Summer Research Project or COOP program with written final report

² Two hours of Calculus are counted as Major Preparatory credit; six hours are counted in Core Curriculum.

³ Required preparatory coursework.

⁴ Counted in Core Curriculum

* Indicates a prerequisite class to be completed before enrolling for upper-division classes.

III. Elective Requirements: 18 hours

Advanced Electives (6 hours)

All students are required to take at least six hours of advanced electives outside their major field of study. These must be either upper-division classes or lower-division classes that have prerequisites.

Free Electives (12 hours)

Both lower- and upper-division courses may count as electives, but the student must complete at least 51 hours of upper-division credit to qualify for graduation.

Physics Electives

- PHYS 3324 Scientific Computing
- PHYS 3380 Astronomy
- PHYS 4301 Quantum Mechanics I
- PHYS 4352 Modern Physics II
- PHYS 4371 Solid State Physics
- PHYS 4381 Space Science
- PHYS 4383 Plasma Physics

Other Courses

- PHYS 1101 College Physics Laboratory I
- PHYS 1102 College Physics Laboratory II
- PHYS 1301 College Physics I
- PHYS 1302 College Physics II
- PHYS 3341 Physics for Bio Science I
- PHYS 3342 Physics for Bio Science II

Bachelor of Science in Physics Degree Requirements (122 hours)

I. Core Curriculum Requirements¹: 42 hours

- A. Communication (6 hours)
 - 3 hours Communication (RHET 1302)
 - 3 hours Communication Elective
- B. Social and Behavioral Sciences (15 hours)
 - 6 hours Government (GOVT 2301 and 2302)
 - 6 hours American History
 - 3 hours Social and Behavioral Sciences Elective
- C. Humanities and Fine Arts (6 hours)
 - 3 hours Fine Arts (ARTS 1301)
 - 3 hours Humanities (HUMA 1301)
- D. Mathematics and Quantitative Reasoning (6 hours)
 - 6 hours Calculus (MATH 2417 and 2419)³
- E. Science (9 hours)
 - 8 hours Chemistry (CHEM 1311/1111, 1312/1112)³
 - 1 hour Physics (PHYS 2125)³

¹ Curriculum Requirements can be fulfilled by other approved courses from accredited institutions of higher education. The courses listed in parenthesis are recommended as the most efficient way to satisfy both Core Curriculum and Major Requirements at U.T. Dallas.

II. Major Requirements: 62 hours

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- PHYS 2325/2125 Mechanics with Recitation/Laboratory*
 - or PHYS 2421/2125 Honors Physics I Mechanics with Recitation/Laboratory*
- PHYS 2326/2126 Electromagnetism and Waves with Recitation/Laboratory*
 - or PHYS 2422/2126 Honors Physics II Electromagnetism and Waves with Recitation/Laboratory*

Major Core Courses (26 hours)

- PHYS 3125 Electronics Laboratory
- PHYS 3311 Theoretical Physics
- PHYS 3312 Classical Mechanics
- PHYS 3325 Electronics
- PHYS 3330 Numerical Methods in Physics and Computational Techniques
- PHYS 3352 Modern Physics I
- PHYS 3416 Electricity and Magnetism
- PHYS 4311 Thermodynamics and Statistical Mechanics
- PHYS 4373 Physical Measurements Laboratory

Major Related Courses (15 hours)

- PHYS 4301 Quantum Mechanics I
- PHYS 4328 Optics
- PHYS 4352 Modern Physics II
- 6 hours Physics Electives
- Advanced Writing (fulfills 3 hours of Core Communications requirement)
- PHYS 4399 Senior Honors in Physics
 - or NATS 4310 Advanced Writing in the Natural Sciences and Mathematics
 - or Summer Research Project or COOP program with written final report

² Two hours of Calculus are counted as Major Preparatory credit; six hours are counted in Core Curriculum.

³ Required preparatory coursework.

⁴ Counted in Core Curriculum

* Indicates a prerequisite class to be completed before enrolling for upper-division classes.

III. Elective Requirements: 18 hours

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All students are required to take at least six hours of advanced electives outside their major field of study. These must be either upper-division classes or lower-division classes that have prerequisites.

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Physics Electives

PHYS 3324 Scientific Computing

PHYS 3380 Astronomy

PHYS 4302 Quantum Mechanics II

PHYS 4371 Solid State Physics

PHYS 4381 Space Science

PHYS 4383 Plasma Physics

PHYS 4V07 Senior Projects Laboratory

Other Courses

PHYS 1101 College Physics Laboratory I

PHYS 1102 College Physics Laboratory II

PHYS 1301 College Physics I

PHYS 1302 College Physics II

PHYS 3341 Physics for Bio Science I

PHYS 3342 Physics for Bio Science I