School of Natural Sciences and Mathematics

Molecular Biology (B.S.)

The Biology Program at UT 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 UT 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.

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

Faculty

Professors: Lee A. Bulla, Santosh D'Mello, Rockford K. Draper, Juan González, Donald M. Gray, Stephen D. Levene, Lawrence J. Reitzer, Li Zhang, Michael Q. Zhang

Associate Professors: Gail A.M. Breen, John G. Burr, Jeff L. DeJong, Ernest M. Hannig, Dennis L. Miller

Assistant Professors: Tianbing Xia, Zhenyu Xuan, Hyuntae Yoo

Professor Emeritus: Hans Bremer, Claud S. Rupert

Senior Lecturers: Irina Borovkov, Mehmet Candas, Vincent P. Cirillo, Wen-ju Lin, Robert C. Marsh, Ruben D. Ramirez, David Murchison, Elizabeth Pickett, Scott A. Rippel, Ilya Sapozhnikov, Wen-Ho Yu

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 UT Dallas; however, students deficient in the biology and chemistry requirements may be delayed in entering upper-division biology courses.

Bachelor of Science in Molecular Biology

Degree Requirements (129 hours)

I. Core Curriculum Requirements[1]: 42 hours

Communication (6 hours)

3 hours Communication (RHET 1302)

3 hours Communication Elective (BIOL 4337, BIOL 4390, BIOL 4391, BIOL 4398, BIOL 4399 or NATS 4310)[2]

Social and Behavioral Sciences (15 hours)

6 hours Government (GOVT 2301 and GOVT 2302)

6 hours American History

3 hours Social and Behavior Sciences Elective

Humanities and Fine Arts (6 hours)

3 hours Fine Arts (ARTS 1301)

3 hours Humanities (HUMA 1301)

Mathematics and Quantitative Reasoning (6 hours)

6 hours Calculus (MATH 2417 and MATH 2419)[3]

Science (9 hours)

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

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[4] Introductory Organic Chemistry Laboratory I

CHEM 2125[4] Introductory Organic Chemistry Laboratory II

CHEM 2323[4] Introductory Organic Chemistry I

CHEM 2325[4] Introductory Organic Chemistry II

MATH 2417 Calculus I

MATH 2419 Calculus II

MATH 2418 Linear Algebra

PHYS 2125 Physics Laboratory I

PHYS 2126 Physics Laboratory II

PHYS 2325 Mechanics

PHYS 2326 Electromagnetism and Waves

Major Core Courses (36 hours)

BIOL 2111[4] Introduction to Modern Biology Workshop I

BIOL 2112[4] Introduction to Modern Biology Workshop II

BIOL 2281[4] Introductory Biology Laboratory

BIOL 2311[4]Introduction to Modern Biology I

BIOL 2312[4] 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 Biology[5]

or BIOL 4399 (3 hours) Senior Honors Research in Molecular and Cell Biology[5]

or BIOL 4391 (3 hours) Senior Research in Molecular and Cell Biology[5]

BIOL 4461 Biophysical Chemistry

Major Related Courses (12 hours)[6]

12 hours upper-division approved molecular biology-related BIOL or CHEM electives

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.

Minor in Biology

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 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 Laboratory[7]

BIOL 3335 Microbial Physiology[8]

BIOL 4350 Medical Microbiology or BIOL 4316 Parasites and Symbionts

BIOL 4345 Immunobiology

CHEM 2323 Introductory Organic Chemistry I

One approved microbiology elective

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

UT 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 UT 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. Graduate courses must be approved by the graduate advisor. 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 21 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.

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, BIOL 4391, BIOL 4398, BIOL 4399, BIOL 4V98, or BIOL 4V99).

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 UT Dallas Health Professions Advising Center (HPAC). Most professional schools prefer that admission applications be channeled through the HPAC.

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

2. Molecular Biology majors may choose BIOL 4337, BIOL 4390, BIOL 4391, BIOL 4398, 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. Indicates a prerequisite class to be completed before enrolling for upper-division classes.

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

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

7. Two hours of BIOL 3V20 may be used to satisfy the upper level elective requirement for Biology and Molecular Biology majors.

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

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