BIOLOGY (BIOL)

Mission

The biology program assists students in recognizing the significance of the biological sciences and in gaining proficiency in the use of the scientific method to solve problems through laboratory experiences.

The program offers a course of study leading to the Bachelor of Arts or the Bachelor of Science degree in Biology. Areas of concentration within these degrees enable the student to focus on educational and post-baccalaureate goals.

Requirements for a Major in Biology

A. **All majors** include the following 22 semester hours of core Biology coursework.

First 2 years		
BIOL 1406	General Biology I	4 hours
BIOL 1407	General Biology II	4 hours
BIOL 2431	Cellular and Molecular Biology	4 hours
BIOL 2430	Ecology and Behavior	4 hours

Last 2 years plus courses needed for concentration		
BIOL 4101	Senior Seminar	1 hour
BIOL 4201	Laboratory Management	2 hours
BIOL 4302*	Biological Internship or	
BIOL 4110-4410*	Biological Research/Project	3 hours

*This will be waived for students completing Student Teaching Field Experience.

B. All students must successfully complete the departmental exit examination.

C. **The Bachelor of Arts (BA) degree** in Biology also requires:

CHEM 1411 General Chemistry I — CHEM 1412 General Chemistry II

AND

MATH 1342 Introductory Statistics or — MATH 1316 Trigonometry or
MATH 2312 Pre-Calculus or — MATH 2413 Calculus I

D. **The Bachelor of Science (BS) degree** in Biology has all of the requirements of the BA degree plus

CHEM 2412 Organic Chemistry I	CHEM 2422 Organic Chemistry II
MATH 2413 Calculus I	MATH 2414 Calculus II
PHYS 2425 Physics I	PHYS 2426 Physics II

E. **Electives.** The biology major will add 19 hours of Biology electives (of which at least 8 hours must be upper division courses) to the core science coursework described in above.

These courses may be selected from the following:

No more than 8 hours from this list:

BIOL 2406	Environmental Biology	4 hours
BIOL 2407	Human Anatomy and Physiology I	4 hours
BIOL 2408	Human Anatomy and Physiology II	4 hours

At least 11 hours from these:

BIOL 3404	Comparative Anatomy	4 hours
BIOL 3302	Terrestrial Field Biology	3 hours
BIOL 3303	Aquatic Field Biology	3 hours
BIOL 3304	Conservation Biology	3 hours
BIOL 3321	Health Physics	3 hours
BIOL 3402	Vertebrate Physiology ($W^{\dagger}$)	4 hours
BIOL 3403	Genetics	4 hours
BIOL 3401	Microbiology	4 hours
BIOL 3463	Biochemistry	4 hours
BIOL 4301	Special Topics	3 hours
BIOL 4410	Biological Research/Projects (in addition to required)	3 hours

This totals 41 hours of biology.
The BA degree total is 103 hours with 18 hours for a minor or electives.
The BS degree total is 118 hours with 3 hours for electives.

In order to help students focus their career goals, we also offer concentrations in biology that meet the needs of those students who wish to enter medical school, health careers, environmental careers, or teaching.

1. **Environmental Biology Concentration**. This track is for students interested in careers in conservation, environmental technology, public policy, and wildlife preservation. This track also prepares students for graduate study in fields such as ecology and environmental science. In addition to the courses described in A-D above, students will take:

BIOL 2406	Environmental Biology	4 hours

BIOL 3302	Terrestrial Field Biology	3 hours
BIOL 3303	Aquatic Field Biology	3 hours
BIOL 3401	Microbiology	4 hours
BIOL 3304	Conservation Biology	3 hours
BIOL	Biology Elective (see list above)	3-4 hours
CHEM 3413	Quantitative Analysis	4 hours
CHEM 4367	Special Topics - Environmental Chemistry	3 hours
MATH 1342	Introductory Statistics	3 hours

Also, recommended courses would be

ENGL 3380	World Literature & the Environment (D‡ W)	3 hours
HIST 4336	Environmental History	3 hours
SOCI 2345	Environmental Sociology	3 hours

This totals 42-43 hours in biology and 7 additional hours in chemistry.
This sequence can be the BA or BS degree.
The BA degree total is 100 hours with 20 hours for electives.

2. **Human Biology Concentration.** This track is for students pursuing admissions into allied health programs and related careers (e.g., health care technician, medical technology, nursing, physical therapy, physician assistant, and public health). In addition to the courses described in items A-D, students will take:

BIOL 2407	Human Anatomy and Physiology I	4 hours
BIOL 2408	Human Anatomy and Physiology II	4 hours
BIOL 3403	Genetics	4 hours
BIOL 3401	Microbiology	4 hours
BIOL	Biology Elective (see list above)	3-4 hours
MATH 1342	Introductory Statistics	3 hours
KINE 4302	Nutrition for Health and Fitness	3 hours

This totals 41-42 hours of biology.
This sequence can be the BA or BS degree.
The BA degree total is 95 hours with 25 hours for electives.

3. **Pre-Medical Concentration**. This track is for students seeking admission into dental, medical, pharmacy, or veterinary programs. In addition to the courses described in A-D above, students will take:

BIOL 3404	Comparative Anatomy	4 hours
BIOL 3402	Vertebrate Physiology (W)	4 hours
BIOL 3403	Genetics	4 hours
BIOL 3401	Microbiology	4 hours
BIOL 3463	Biochemistry	4 hours

This totals 42 hours of biology.

This sequence is a BS degree.
The BS degree total is 116 hours with 4 hours for electives.

4. **Biology Educator**. This track is for students pursuing a teaching career in biology. In addition to the courses described in items A-D, students will take:

BIOL 2407	Human Anatomy and Physiology I	4 hours
BIOL 2408	Human Anatomy and Physiology II	4 hours
BIOL 3302	Terrestrial Field Biology	3 hours
BIOL 3303	Aquatic Field Biology	3 hours
BIOL 3403	Genetics	4 hours
BIOL 3401	Microbiology	4 hours
MATH 1342	Introductory Statistics	3 hours
EDUC 1301	Introduction to Teaching Profession	3 hours
EDUC 2302	Technology Application	3 hours
EDUC 3312/3321	Reading	3 hours
EDUC 3365	K-12 TEKS Curriculum and Exam Preparation	3 hours
EDUC 4306	Assessment and Instructional Management	3 hours
EDUC 4307	Student Teaching Seminar	3 hours
EDUC 4607*	Student Teaching Field Experience	9 hours

* this replaces the Biology Research or Internship Requirement

This totals 39 hours of biology plus 27 hours of required education courses.
This sequence can be the BA or BS degree.
The BA degree total is 117 hours with 3 hours of electives.

Requirements for a Minor in Biology

1. A minimum of 21 semester hours including BIOL 1406, BIOL 1407, BIOL 2431, BIOL 2430, 1 hour of seminar (BIOL 3101, BIOL 4101, or BIOL 4102) and 4 additional credit hours in upper division hours (see list under E above.)

2. Successful completion of CHEM 1411, CHEM 1412 and MATH 1316 or higher.

3. Transfer students seeking a minor in biology must complete at least 10 semester hours in biology, including at least one semester of biology seminar while in residence at Huston-Tillotson University.

† W = Writing Intensive Course
‡ D = Diversity Course

COURSES IN BIOLOGY (BIOL)

BIOL 1406 General Biology I **4 Credit Hours**
This course introduces foundational concepts in Biology, including scientific method, the physical and chemical basis of life, cell structure and function, molecular genetics, inheritance, and evolution. Includes laboratory. Three lecture hours and three laboratory hours per week.
Prerequisite: none **Offered: Fall/Spring**

BIOL 1407 General Biology II **4 Credit Hours**
This course serves as a continuation of BIOL 1406, extending into the topics of biodiversity and classification of organisms. Includes laboratory. Three lecture hours and three laboratory hours per week.
Prerequisite: none **Offered: Fall/Spring**

BIOL 1408 Introduction to Biology **4 Credit Hours**
Non-majors are introduced to basic concepts in biology. Included are discussions of the scientific method, cellular organization, genetics, evolution, and diversity. Biology majors may only take this course as an elective. Three lecture hours and two laboratory hours per week.
Prerequisite: None **Offered: Fall/Spring**

BIOL 2401 Human Anatomy and Physiology I **4 Credit Hours**
This course is an examination of the structure, function, and organization of the human body, including general cell and molecular mechanisms as well as study of the integumentary, skeletal, muscular, nervous, endocrine and special sensory systems. Laboratory includes cat dissection. Three lecture hours and three laboratory hours per week.
Prerequisite: 24 hours of course credit **Offered: Fall/Spring**

BIOL 2402 Human Anatomy and Physiology II **4 Credit Hours**
This course is an examination of the structure, function, and organization of the human body, including the cardiovascular, lymphatic, immune, respiratory, digestive, urinary and reproductive systems. Laboratory includes cat dissection. Three lecture hours and three laboratory hours per week.
Prerequisite: BIOL 2401 **Offered: Fall/Spring**

BIOL 2406 Environmental Biology **4 Credit Hours**
Non-majors are introduced to basic ecological principles and the effects of humans on the environment. The course includes studies of populations, communities,

ecosystems, energy flow, resources, pollution, waste management, and the effects of urbanization. Three lecture hours and two laboratory hours per week.
Prerequisite: None **Offered: Fall/Spring**

BIOL 2430 Ecology and Behavior **4 Credit Hours**
A study of the relationships between organisms and their external environment is made. Included are studies of physiological ecology, population dynamics, community structure, energy flow through ecosystems, and evolution. Three lecture hours and three laboratory hours per week. This course is a writing intensive course.
Prerequisites: BIOL 1406 or BIOL 1407 **Offered: Fall/Yearly**

BIOL 2431 Cellular and Molecular Biology **4 Credit Hours**
Included in this course are discussions of cellular organization, cell respiration and photosynthesis, and cell reproduction. This course is a prerequisite for all upper division Biology courses. Non-majors must have consent of the instructor. Three lecture hours and three laboratory hours per week.
Prerequisites: BIOL 1406 or BIOL 1407 and CHEM 1411 **Offered: Spring/Yearly**

BIOL 3302 Terrestrial Field Biology Replaces BIOL 3201 3 Credit Hours
A study of ecological methods in terrestrial systems, with an emphasis on quantitative and experimental procedures used to study these ecosystems. This course is conducted mostly at field sites off campus in the Austin area. One lecture and one four hour field trip per week.
Prerequisites: BIOL1406, BIOL 1407, or BIOL 2406 **Offered: Spring/Every Other Year**

BIOL 3303 Aquatic Field Biology **3 Credit Hours**
A study of ecological methods in aquatic systems, with an emphasis on quantitative and experimental procedures used to study these ecosystems. This course is conducted mostly at field sites off campus in the Austin area. One lecture and one four hour field trip per week.
Prerequisites: BIOL1406, BIOL 1407, or BIOL 2406 **Offered: Spring/Every Other Year**

BIOL 3301 Science Knowledge and Skills in Elementary Schools **3 Credit Hours**
This course focuses on the concepts and skills needed to teach science in the elementary school. Topics addressed include the knowledge and skills from the Texas Essential Knowledge and Skills (TEKS) – the curriculum of Texas public schools.

Students have the opportunity to observe and practice the pedagogy that they experience. A minimum of 20 hours of field experience is required of all students.
Prerequisites: BIOL 1406 or BIOL 1407 or BIOL 2430 or PHYS 1415 **Offered: Spring As Needed**

BIOL 3304 Conservation Biology **3 Credit Hours**
This course introduces strategies for preserving the Earth's biodiversity. This is an extremely multidisciplinary field. As a result, students who take this course will learn about a variety of topics including history of natural resource conservation, population genetics, evolutionary biology, animal behavior, ecology, systematics, wildlife and fisheries management techniques, political science, and the law.
Prerequisites: BIOL1406, BIOL 1407, or BIOL 2406 **Offered: As Needed**

BIOL 3321 Health Physics **3 Credit Hours**
An examination of the biophysical basis for radiation protection, dosimetry and dosage, shielding, standards for radiation exposure, waste treatment and disposal, emergency safety procedures. Three hours of lecture per week. Cross listed with PHYS 3321.
Prerequisite: PHYS 3420 **Offered: As Needed**

BIOL 3401 General Microbiology **4 Credit Hours**
This course is a survey of bacteria and viruses with emphasis on medical, industrial, and immunological considerations. Three lecture hours and three laboratory hours per week.
Prerequisites: BIOL 2431 **Offered: Fall/Every Other Year**

BIOL 3402 Vertebrate Physiology **4 Credit Hours**
This course is a study of the control of the internal environment with examples drawn from various vertebrates. This is a required course for biology majors Three lecture hours and three laboratory hours per week.
Prerequisites: BIOL 2431 and CHEM 1421 **Offered: Spring/Every Other Year**

BIOL 3403 Genetics **4 Credit Hours**
An introduction to the principles of heredity at the molecular and cellular level is covered in this course. This is a required course for biology majors. Three lecture hours and three hours of laboratory each week.
Prerequisites: BIOL 2407 and CHEM 1421 (may be taken concurrently) **Offered: Fall/Every Other Year**

BIOL 3404 Comparative Anatomy **4 Credit Hours**

A comparative study of the structure of selected vertebrates with special reference to the modification through natural selection of homologous structures. Three lecture hours and three laboratory hours per week.

Pre-Requisites: At least 8 hours of Biology **Offered: Fall/Yearly**
(BIOL 1406 and 1407)

BIOL 3463 Biochemistry **4 Credit Hours**

A survey of the major constituents of living matter. Biophysical and biochemical processes in plants and animals are studied. Laboratory work includes isolation, identification, and application of quantitative analytical procedures to characteristic materials. Three lecture hours and one three-hour laboratory period each week. Cross listed with CHEM 3463.

Prerequisites: CHEM 2412 **Offered: As Needed**

BIOL 4101 Biology Senior Seminar **1 Credit Hour**

Senior seminar courses are to be taken by all biology majors. The student attends one discussion hour per week and at least one science seminar participation hour per week. Oral discussion, a written report, and presentation on selected topics developed from information gathered from professional journals and reference books are required. In some cases laboratory investigations with written reports may be substituted. Specific requirements for the satisfactory completion of this course are outlined in the course syllabi for each semester.

Prerequisite: Senior Standing **Offered: Fall/Spring Yearly**

BIOL 4201 Laboratory Management **2 Credit Hours**

This course covers the preparation and management of laboratories for BIOL 1408, BIOL 2406, BIOL 1410, BIOL 1411, or BIOL 2431. One hour meeting with instructor and four laboratory (preparation) hours per week. Consent of instructor required.

Prerequisites: BIOL 2431 and BIOL 2430 **Offered: Fall/Spring Yearly**

BIOL 4301 Special Topics in Biology **3 Credit Hours**

This course will cover selected topics in biology of special interest to students and instructors. They may be a more in-depth treatment of survey courses or cover a specialty in biology. Course may include the background and current findings regarding a specific phyla, a life system, reproduction, botany, ecology molecular genetics, marine or freshwater biology, integrative or developmental biology, or neurobiology.

Prerequisite: Instructor approval **Offered: As Needed**

BIOL 4302 Biological Internship 3 Credit Hours
An internship experience for majors in biology. Students work as interns in one of the areas of concentration. Students may not enroll in this course without prior department approval.
Prerequisites: 12 biological major credits Offered: Fall/Spring Yearly and advisor approval

BIOL 4310 Biological Research/ Project 3 Credit Hours
The student plans and implements an independent biological study using facilities available at Huston-Tillotson University or other sites if recommended by the biology faculty. Course may be repeated for a maximum of 9 credits.
Prerequisite: Instructor approval Offered: Fall/Spring Yearly