Biological Sciences (BS)

This program is offered by the College of Arts & Sciences/Biological Sciences Department.

Program Description

The bachelor of science (BS) degree is designed for students who seek a rigorous, cross-disciplinary education in the physical sciences. Additional coursework is taken in the areas of biology, chemistry, physics, and mathematics, providing the student with a broad scientific foundation suitable for careers in biotechnology, medicine, science-based research, health-related professions, chemical and molecular disciplines, and advanced graduate studies.

Students can earn the BS in biological sciences alone, or with one of three emphases: research and technology, health and medicine, or chemistry.

Learning Outcomes

Students who complete the bachelor of science in biological sciences will be able to:

- Integrate biological, chemical, physical, and math principles to develop and carry out an independent research project.
- Communicate current scientific ideas effectively in both oral and written formats to a diverse audience.
- Think critically and quantitatively assess innovative, global research in a scientific discipline.

Degree Requirements

A minimum of 128 credit hours consisting of the following:

- 64 credit hours core coursework (described below)
- 16 additional credit hours in BIOL or CHEM or PHYS at the 3000-4000 level
- or Courses specific to the student's degree emphasis (see below)
- Applicable University Global Citizenship Program hours, with accommodations for the biological sciences BS
- Electives

Global Citizenship Program for Biological Sciences BS

Requirements are modified to allow BIOL 1550 to satisfy both a requirement of the major and also the GCP Physical and Natural World requirement and to allow MATH 1610 to satisfy both a requirement of the major and the GCP Quantitative Literacy requirement.

Curriculum

All of the degree options for the bachelor of science in biological sciences require the same 64 hours of core coursework as follows:

Core Courses (64 hours)

- BIOL 1550, 1551 Essentials of Biology I (5 hours)
- BIOL 1560, 1561 Essentials of Biology II (5 hours)
- BIOL 2010 Evolution (3 hours)
- BIOL 3050, 3051 Genetics (4 hours)
- BIOL 3080, 3081 Cell Biology (4 hours)
- BIOL 4400 Research Methods (3 hours)
- BIOL 4430 BS Senior Thesis (4 hours)
- CHEM 1100, 1101 General Chemistry I (4 hours)
- CHEM 1110, 1111 General Chemistry II (4 hours)
- CHEM 2100, 2101 Organic Chemistry I (4 hours)
- CHEM 2110, 2111 Organic Chemistry II (4 hours)
- CHEM 3100, 3101 Biochemistry I (4 hours)
- MATH 1610 Calculus I (5 hours)
- MATH 3200 Statistics (3 hours)
- PHYS 2030, 2031 University Physics I (4 hours)
- PHYS 2040, 2041 University Physics II (4 hours)

BS in Biological Sciences (80 hours)

The general degree offers the greatest flexibility, allowing students to select 16 hours of electives from any of the department's 3000+ level BIOL or CHEM or PHYS courses in addition to the 64 credits of core coursework in biological sciences listed above.

Emphasis in Research & Technology (84 hours)

The research and technology emphasis features upper-level courses that emphasize the variety of laboratory technologies, research methods, and data analysis techniques commonly encountered in a research environment. It is designed primarily for students pursuing a career path in: (a) commercial, academic, or government research, (b) high-demand technical and laboratory positions, and (c) graduate studies in advanced biology fields and related areas such as biochemistry and biophysics.

Emphasis-Specific Learning Outcomes

In addition to the general learning outcomes, students who complete the emphasis in research and technology will be able to:

- Analyze methods in research from current literature in biology.

Degree Requirements for the Emphasis in Research & Technology

In addition to the 64 credit hours of core coursework in biological sciences, the following courses are required for the emphasis in research and technology:

- BIOL 3900 Journal Club (3 hours)
- BIOL 4700 Independent Research in Biology I (2 hours)
- or CHEM 4700 Independent Research in Chemistry I (2 hours)
- or PHYS 4700 Independent Research in Physics I (2 hours)

A minimum of 9 credit hours selected from the following:

- BIOL 3120, 3121 Microbiology (4 hours)
- BIOL 3200, 3201 Ecology (4 hours)
- BIOL 3400 Cell Culture (3 hours)
- BIOL 3600 Topics in Biology* (3-4 hours)
- BIOL 3700, 3701 Plant Physiology (4 hours)
- BIOL 4000, 4001 Methods in Molecular Biology (4 hours)
- BIOL 4050 Gene Expression (3 hours)

A minimum of 6 credit hours selected from the following:

- CHEM 3110, 3111 Biochemistry II (4 hours)
- CHEM 3500, 3501 Physical Chemistry I (4 hours)
- CHEM 3510, 3511 Physical Chemistry II (4 hours)
- CHEM 3600 Topics in Chemistry* (3-4 hours)
- CHEM 3700, 3701 Fluorescence (4 hours)
- CHEM 4100 Inorganic Chemistry (3 hours)
- MATH 3210 Mining Foundations (3 hours)
- or MATH 3220 Data Mining Methods (3 hours)

*Only approved Topics course can count towards this emphasis

Emphasis in Health & Medicine (82 hours)

The emphasis in health and medicine is designed for students interested in a continuing education in any of the various medical fields, particularly those pursuing a pre-professional program like pre-med or pre-vet. It is meant primarily for students preparing...
for careers such as medical doctors, physician's assistants, dentists, veterinarians, chiropractors, physical therapists, or athletic trainers. In addition to the science courses listed below, students entering health and medical fields are encouraged to take 4 semesters of a foreign language and 2 semesters of writing intensive courses.

Emphasis-Specific Learning Outcomes

In addition to the general learning outcomes, students who complete the emphasis in health and medicine will be able to:

- Analyze how sickness and disease at the molecular and cellular level affect the functioning of humans and animals.

Degree Requirements for the Emphasis in Health & Medicine

In addition to the 64 credit hours of core coursework in biological sciences, the following courses are required for the emphasis in health and medicine:

- BIOL 3010, 3011 Human Anatomy & Physiology I (4 hours)
- BIOL 3020, 3021 Human Anatomy & Physiology II (4 hours)
- CHEM 3110, 3111 Biochemistry II (4 hours)

A minimum of 6 credit hours selected from the following:

- BIOL 3120, 3121 Microbiology (4 hours)
- BIOL 3150 Nutrition (3 hours)
- BIOL 3800 Medical Terminology (3 hours)
- BIOL 4300 Immunology (3 hours)
- BIOL 4500 Virology (3 hours)
- BIOL 3600 Topics in Biology* (3-4 hours)
- CHEM 3600 Topics in Chemistry* (3-4 hours)
- BIOL 4700 Independent Research in Biology (up to 3 hours)
- CHEM 4700 Independent Research in Chemistry (up to 3 hours)

*Only approved Topics courses can count toward this emphasis

Emphasis in Chemistry (82 hours)

The emphasis in chemistry is designed for students who desire to further expand and deepen their knowledge in the field of chemistry. It is particularly well-suited for students who are interested in pharmaceuticals and for those pursuing laboratory positions or graduate studies in areas involving chemical techniques. This track requires additional coursework in mathematics and advanced chemistry courses, and the electives include biology courses that contain a significant chemical component. In addition, students pursuing the chemistry track are expected to develop a senior thesis research topic that has a significant chemical basis.

Emphasis-Specific Learning Outcomes

In addition to the general learning outcomes, students who complete the emphasis in chemistry will be able to:

- Explain the molecular structure of chemical substances and the connection between molecular structure and chemical behavior.

Degree Requirements for the Emphasis in Chemistry

In addition to the 64 credit hours of core coursework in biological sciences, the following courses are required for the emphasis in chemistry:

- CHEM 3110, 3111 Biochemistry II (4 hours)
- MATH 1620 Calculus II (5 hours)

- Minimum of 9 credit hours of 3000+ level CHEM electives. (Up to 3 credit hours of CHEM 4700 can be used towards this emphasis)