

UMSL Biology

Career Outlook

The biology degree programs, undergraduate and graduate, are designed to prepare the student for further training. The undergraduate degree is designed to prepare the student for professional training in areas such as medicine, teaching, dentistry, veterinary medicine, optometry and related areas, or for further graduate training in research. The Master of Science program is an extension of the undergraduate program and has as its goals three main objectives: 1) provide research-oriented training and education; 2) provide qualified graduates for doctoral programs; and 3) provide high school and junior college biology teachers with training necessary to maintain and improve their teaching effectiveness.

Undergraduate Studies

Degrees and Areas of Concentration

The Department of Biology provides academic programs leading to the BA or BS in biology; and, in cooperation with the College of Education, offers the BS in secondary education with a major in biology and the BA or BS in biology with teacher certification.

Faculty

Biology faculty members are engaged in teaching and research in areas ranging from molecular biology to population studies. Majors have the chance to take courses which help them develop both theoretical and experimental backgrounds necessary for further work in some of the most rapidly expanding fields of biological science or to

pursue in-depth studies in specific areas through advanced courses, seminars and individualized research programs.

Minor in Biology

Students majoring in another discipline may earn a minor in biology by completing a prescribed course of study. Unique programs can be developed to coordinate with special career objectives. Students should consult their advisor and the chair of the Department of Biology.

Graduate Studies

The Department of Biology also offers work leading to the MS and PhD degrees in biology.

Facilities

Department facilities include research and teaching laboratories, environmental chambers, greenhouses, animal care rooms and an array of supporting modern research instrumentation. Also available are wildlife facilities at Weldon Springs Experimental Farm and Tyson Tract, both within 30 to 45 minutes of the campus. CE I BA Biological Centre in Guyana provides a more distant site in the tropics for several field courses and for independent student research projects.

Cooperative Programs

The department also participates in a cooperative consortium program in biology with Washington University in St. Louis, Saint Louis University, Southern Illinois University Edwardsville and the Missouri Botanical Garden.

General Education Requirements

Students must satisfy the University and College general education requirements. Biology courses may be used to meet the science and mathematics requirement of the University.

Satisfactory-Unsatisfactory Option

Up to 18 credit hours may be taken on a satisfactory-unsatisfactory basis. Excluded from this option are required courses in chemistry, physics, mathematics, or psychology and biology courses other than BIOL 4889, Senior Seminar and BIOL 4905, Research.

Degree Requirements

Bachelor of Arts in Biology

The BA degree provides maximum flexibility for biology majors to pursue an undergraduate liberal arts course of study that can lead to professional careers in medicine, allied health, public and environmental health, law and graduate studies in the life sciences.

All biology majors must take at least 39 credit hours but not more than 50 hours in appropriate biology coursework. The following biology foundation courses must be included in the 39 credit hours:

1) Core Courses

The following biology courses or their equivalents are required:

- BIOL 1811, Introductory Biology I
- BIOL 1821, Introductory Biology II
- BIOL 2012, Genetics
- BIOL 3302, Introduction to Evolution
- BIOL 3622, Cell Structure and Function
- BIOL 4712, Biochemistry
- BIOL 4889, Senior Seminar, or 4985 and 4986, for those seeking teacher certification

One of the following diversity courses:

- BIOL 2402, Vertebrate Biology or
- BIOL 2442, Invertebrate Biology or
- BIOL 2482, Microbiology or
- BIOL 2501, Biology of Plants or
- BIOL 4402, Ornithology or
- BIOL 4422, Entomology or

- BIOL 4482, Parasitology or
- BIOL 4501, Flowering Plants Families or

2) Elective Courses

Three additional biology lecture courses, at the 2000-level or higher are required. They may be selected from any of the lecture or lecture-laboratory courses offered. Selection of these courses should reflect the career interest of the student. Biology courses taken to fulfill basic skill requirements (e.g., statistics requirement or biochemistry option) can be used to satisfy this requirement.

At least two biology lecture courses taken as part of the core or as electives must be at the 4000-level or higher. No more than one of these higher-level courses can be used to fulfill other requirements (e.g., diversity or statistics requirements, or biochemistry option.)

Laboratory Course Requirements

Three biology laboratory courses at the 2000-level or higher are required. They may be taken from any of the lecture-laboratory or laboratory courses offered. Two credit hours of BIOL 4905 can be used to fulfill one laboratory requirement. Students may take CHEM 4733 to satisfy one of these laboratory course requirements, but students may not use both BIOL 4713 and CHEM 4733 to fulfill this requirement.

Basic Skills Requirement

A well-rounded biologist needs certain skills outside the biology subject matter. The basic skills requirement is designed to provide the student with a background in communication skills and knowledge in associated science areas.

1) Communication Skills

Courses in foreign languages and in writing are required for development of the communication skills needed to transmit scientific information. The following satisfy this requirement:

Foreign Language

The foreign language requirement of the College of Arts and Sciences fulfills the departmental requirement.

Writing

ENGL 3100, Advanced Expository Writing or ENGL 3160, Writing in the Sciences (strongly preferred)

Related Area Requirements

2) Associated Science Area

The following courses or their equivalents must be successfully completed in science areas related to biology:

PHYS 1011, Basic Physics
PHYS 1012, Basic Physics
CHEM 1111, Introductory Chemistry I or CHEM 1082 and CHEM 1091
CHEM 1121, Introductory Chemistry II
CHEM 2612, Organic Chemistry I

One of the following:

CHEM 2223, Quantitative Analysis or CHEM 2622, Organic Chemistry II or CHEM 2633, Organic Chemistry Laboratory or
BIOL/CHEM 4712, Biochemistry
MATH 1310, College Algebra
MATH 1035, Trigonometry
MATH 1100, Basic Calculus or MATH 1800, Analytical Geometry and Calculus

One of the following:

BIOL 4122, Biometry or
MATH 1310, Elementary Statistical Methods or
MATH 1320, Applied Statistics I or
ED REM 5730, Educational Statistics or
PSYCH 2201, Psychological Statistics

Bachelor of Science in Biology

The BS degree in biology is designed to prepare students for basic technical positions and graduate studies in the life sciences. Candidates for the degree have the same foundation courses, breadth and General Education requirements as those seeking the Bachelor of Arts degree. In addition, certain minimal requirements in depth of study, laboratory experience, research, data processing, communication skills and background in associated science areas are required.

There is no foreign language requirement for the BS degree. However, students should realize that the literature for biological studies is in many different languages and the ability to extract information from this literature is an important skill.

In order to fulfill the requirements for the BS degree, a minimum of 46 hours but not more than 50 hours must be completed in appropriate biology course work. A minimum of 17 hours in biology (including three laboratories) must be completed at University of Missouri–St. Louis. Candidates must have a cumulative grade point average of 2.0 or better in biology courses.

1) Foundation Courses

All candidates for the BS degree must successfully complete the same basic courses as those for the BA degree.

2) Elective Courses

Four additional biology lecture courses at the 2000-level or higher are required. They may be selected from any of the lecture or lecture-laboratory courses offered. Selection of these courses should reflect the career interest of the student. Biology courses taken to fulfill basic skill requirements (e.g., statistics requirement or biochemistry option) can be used to satisfy this requirement.

At least three biology lecture courses taken as part of the core or as electives must be at the 4000-level or higher.

No more than two of these higher-level courses can be used to fulfill other requirements (e.g., diversity or statistics requirements, or biochemistry option.)

Laboratory Course Requirements

Four biology laboratory courses at the 2000-level or higher are required. They may be selected from any of the lecture-laboratory or laboratory courses offered. Two credit hours of BIOL 4905 can be used to fulfill one laboratory requirement. Students may take CHEM 4733 to satisfy one of these laboratory course requirements, but students may not use both BIOL 4713 and CHEM 4733 to fulfill this requirement.

Lecture Course Requirement

An additional four lecture courses are required and can consist of any of the other lecture courses offered at the 2000-level or above. At least two of the courses must be at the 4000- or 5000-level. Selection of the 4000- or 5000-level courses should reflect the career interest of the student and at least one of the courses should be in a topic area that could lead to an independent research project (BIOL 4905). BIOL 4614, 4712, 4889 and 4905 cannot be used to fulfill this requirement.

Basic Skills Requirement

A well-rounded biologist needs certain skills outside the biology subject matter. The basic skills requirement is designed to provide the student with a background in communication skills and knowledge in associated science areas.

1) Data Processing

Students must show a basic understanding of mechanisms for handling data by successfully completing one course in each of the following sets:

Set A. Statistics

MATH 1310, Elementary Statistical Methods, or
MATH 1320, Applied Statistics I, or
EDUC 5730, Educational Statistics, or
PSYCH 2201, Psychological Statistics, or
BIOL 4122, Biometry.

Set B. Computer Science

COMP SCI, 1010, Introduction to Computing and the Internet
COMP SCI, 1250, Introduction to Computer Science
INF SYS 1800, Computers and Information Systems

2) Communication Skills

Courses in formal speaking and technical writing are required to develop the minimal communication skills needed to transmit scientific information.

The following two courses satisfy this requirement:

COMM 1040, Introduction to Public Speaking
ENGL 3100, Advanced Expository Writing
or ENGL 3160, Writing in the Sciences
(preferred)

3) Associated Science Area

The following courses or their equivalents must be successfully completed in science areas related to biology:

PHYSICS 1011, Basic Physics
PHYSICS 1012, Basic Physics
CHEM 1111, Introductory Chemistry I, (or
CHEM 1082, General
Chemistry I, plus CHEM 1091, General
Chemistry II)
CHEM 1121, Introductory Chemistry II
CHEM 2612, Organic Chemistry I
CHEM 2622, Organic Chemistry II
CHEM 2633, Organic Chemistry Laboratory,
or CHEM 2223, Quantitative Analysis
PHIL 3380, Philosophy of Science or PHIL
2256, Bioethics
MATH 1030, College Algebra and MATH
1035, Trigonometry
MATH 1100, Basic Calculus, or MATH 1800,
Analytical Geometry and Calculus I

Research Opportunity

All students acquiring a Bachelor of Science degree are strongly encouraged to complete a minimum of two credit hours of undergraduate research, BIOL 4905. The privilege of doing undergraduate research provides students with a firsthand opportunity to experience the research process under the supervision of a faculty member or off-campus scientist. The project normally includes a library search of pertinent literature, laboratory or field experience and a summary paper.

Biology majors may take any of the following 1000-level Biology courses:

- BIOL 1081, Global Ecology
- BIOL 1102, Human Biology
- BIOL 1131, Human Physiology and Anatomy I
- BIOL 1141, Human Physiology and Anatomy II
- BIOL 1162, General Microbiology
- BIOL 1202, Environmental Biology

These courses do not count toward credit in the major. They may be included in the 120 hours required for graduation as elective credit.

Bachelor of Science in Education with Emphasis in Biology

The BSEd. is a professional degree designed for those individuals who wish to pursue a teaching career in biology in the secondary schools. The biology requirements parallel those for the BA degree with the exception that BIOL 4985, Methods of Teaching Biology in Secondary Schools and BIOL 4986, Laboratory in Teaching Life Science, are substituted for BIOL 4889, Senior Seminar. Students must also fulfill the requirements for the BSEd. degree as prescribed by the College of Education.

Bachelor of Arts in Biology with Teacher Certification

Biology majors interested in teaching biology in secondary schools may obtain teacher certification in cooperation with the College of Education by fulfilling the BA or BS with certain prescribed courses in biology, with the exception of BIOL 4889, Senior Seminar and in addition, completing the following courses:

- PSYCH 1003, General Psychology
- ED FND 1111, The School in Contemporary Society
- ENGL 3160, Writing in the Sciences
- HIST 1001, 1002, or 1003, American Civilization
- POL SCI 1100, Introduction to American Politics
- PHIL 3380, Philosophy of Science
- COMM 1040, Introduction to Public Speaking
- TH DAN 1210, Fundamentals of Acting
- GEOL 1001, General Geology

- ATM SC 1001, Elementary Meteorology
- ED PSY 3312, The Psychology of Teaching and Learning
- ED TEC 2248, Utilization of Computer-Based Materials in Instruction
- TCH ED 3310, Introduction to Instructional Methods
- SEC ED 3213, Techniques of Secondary School Teaching and Field Study
- SPEC ED 3313, The Psychology and Education of Exceptional Individuals
- SEC ED 4391, Teaching Reading in Secondary School

Content Areas

- BIOL 4985, Curriculum and Methods of Teaching Life Sciences
- BIOL 4986, Laboratory in Teaching the Life Sciences
- SEC ED 3290, Secondary School Student Teaching
- BIOL 4999, Science Teaching Intern Seminar

Since specific biology courses are required for teaching endorsement, contact the Department of Biology and College of Education for special advising regarding teacher certification.

Minor in Biology

Students may minor in biology by fulfilling the requirements, consisting of a minimum of 19 credit hours, of which at least 9 hours of the biology course credits for the minor must be taken in residence at University of Missouri–St. Louis.

Requirements are:

1. BIOL 1811 and BIOL 1821, Introductory Biology I and II
2. Must take three additional courses, which should be at the 2000-level or above totaling no less than 9 credit hours.

All students must consult with an advisor to plan an appropriate course of study. The chair of the Department of Biology must approve this program.

Under certain circumstances, a student may deviate from the prescribed course of study and substitute as his or her program a group of

courses that exhibit a coherent area of specialization to coordinate with a unique career objective. Such a candidate must receive prior approval by the biology department in order to pursue this program.

Candidates must have a cumulative grade point average of 2.0 or better in the minor and none of the courses may be taken on a satisfactory-unsatisfactory basis.

Minor in Environmental Studies

This is an interdisciplinary program that integrates the natural and physical sciences with the social sciences and humanities to study current environmental problems resulting from human population growth, global climate change, overuse of natural resources, pollution and biodiversity loss. A minimum 18 hours are required, 9 of which must be in the natural and physical sciences, including the listed Honors College courses and 9 must be from the social sciences and humanities. A total of 12 hours must be taken at or above the 2000 level and one course at or above the 3000 level. At least 9 hours must be taken while in residence at UMSL. A minimum GPA of 2.0 is required.

ANTHRO 1005, Introduction to Biological Anthropology
ANTHRO 3270, Introduction to Biological Anthropology
BIOL 1202, Environmental Biology
BIOL 1821, Introductory Biology: Organisms and the Environment
BIOL 2102, General Ecology
BIOL 2103, General Ecology Laboratory
BIOL 2501, Biology of Plants
BIOL 3122, Tropical Resource Ecology
BIOL 3202, Conservation Biology
BIOL 3203, Conservation Biology Laboratory
BIOL 3302, Introduction to Evolution
BIOL 4102, Behavioral Ecology
BIOL 4192, Applications of Geographic Information Systems
BIOL 4222, Tropical Ecology and Conservation
BIOL 4245, Field Biology
BIOL 4270, Global Climate Change
BIOL 4402, Ornithology

BIOL 4422, Entomology
BIOL 4501, Plant Families
ECON 4160, Geospatial Analysis in the Social Sciences
ECON 4170, Cost-Benefit Analysis
ECON 4550, Natural Resource Economics
GEOL 1002, Historical Geology
HONORS 2050, Inquiries in the Natural Sciences (when topic appropriate)
HONORS 2051, Inquires in the Sciences: Laboratory or Fieldwork (when topic appropriate)
INTBUS 4281/INTBUS 5198, Entrepreneurship in the Global Environment
PHIL 2255, Environmental Ethics
POL SCI 3480, Environmental Politics
POL SCI 3595, Studies in Comparative Politics (when topic appropriate)
POL SCI 3850, International Organizations & Global Problem Solving (when topic appropriate)
POL SCI 3900, Special Readings (when topic appropriate)
POL SCI 4460, Urban Planning and Politics

Undergraduate Certificate in Biochemistry

The university offers a certificate program for science majors who are interested in careers in biochemistry. The Biochemistry Certificate is an interdisciplinary specialization, which may be earned within either a biology major or chemistry major. To earn the certificate, biology majors must enroll in the Biochemistry Certificate Program upon the completion of 60 credit hours, fulfill all the science (biology, chemistry, math and physics) course requirements for the BS degree in biology and successfully complete the following courses:

CHEM 2223, Quantitative Analysis
CHEM 2622, Organic Chemistry II
CHEM 2633, Organic Chemistry Laboratory
BIOL/CHEM 4712, Biochemistry
BIOL 4713, Techniques in Biochemistry
CHEM 4722, Advanced Biochemistry
CHEM 4733, Biochemistry Laboratory

And three of the following biology courses:

BIOL 2482, Microbiology
BIOL 2483, Microbiology Laboratory
BIOL 3642, Development
BIOL 4602, Molecular Biology
BIOL 4612, Molecular Genetics of Bacteria
BIOL 4614, Biotechnology Laboratory I
BIOL 4622, Molecular Cell Biology
BIOL 4632, Nucleic Acid Structure and Function
BIOL 4842, Immunobiology

Undergraduate Certificate in Biotechnology

The university offers an undergraduate certificate program for biology majors who are interested in careers in biotechnology, including biochemistry, microbiology, molecular biology, cell biology and developmental biology. To earn the certificate, biology majors must enroll in the Biotechnology Certificate Program upon the completion of 60 credit hours, fulfill all the science (biology, chemistry, math and physics) course requirements for the BS degree in biology and successfully complete the following courses:

BIOL 2013, Genetics Laboratory
BIOL 2482, Microbiology
BIOL 2483, Microbiology Laboratory
CHEM 2622, Organic Chemistry II
BIOL 4614, Biotechnology Laboratory I
BIOL /CHEM 4712, Biochemistry
BIOL/CHEM 4713, Techniques in Biochemistry or
CHEM 4733, Biochemistry Laboratory

One of the following two courses:

BIOL 4602, Molecular Biology
BIOL 4612, Molecular Genetics of Bacteria

And one of the following courses:

BIOL 4615, Biotechnology Laboratory II
BIOL 4622, Molecular Cell Biology
BIOL 4632, Nucleic Acid Structure and Function
BIOL 4652, Virology
CHEM 4722, Advanced Biochemistry
BIOL 4842, Immunobiology

Undergraduate Certificate in Conservation Biology

The Certificate in Conservation is a multidisciplinary program of study integrating theoretical and applied topics associated with conservation biology. The certificate is intended for undergraduate students with majors in biology or in any other field who wish to develop a specialization in conservation. The certificate is offered by the Department of Biology in cooperation with the departments of Anthropology, Economics, History, Political Science, Social Work and Sociology. Building on a core curriculum, students can elect courses from these departments to complete their requirements. Regularly enrolled undergraduates at University of Missouri–St. Louis or individuals with baccalaureate degrees who wish to receive a Certificate in Conservation Biology are eligible to participate in the conservation certificate program. To participate, students must apply to the certificate program. Application forms are available from the Department of Biology. Guidelines for admission to the certificate program are also available. Individuals with baccalaureate degrees who are interested in this certificate must apply to the university as unclassified undergraduates. The certificate requires completion of 21 credit hours, outlined below. Students should consult the Bulletin with regard to prerequisites for any of the courses listed here.

Core Courses

Biology

BIOL 2102, General Ecology
BIOL 3202, Conservation Biology
BIOL 3203, Conservation Biology Laboratory
BIOL 4299, Practicum in Conservation

Electives: The remaining 11 credits must be selected from the courses listed below. Five credits must be taken from within biology and 6 credits outside biology, from at least two departments.

Anthropology

ANTHRO 2120, Native Peoples of North America
ANTHRO 2131, Archaeology of Missouri
ANTHRO 2132, Archaeology of North America

Biology

BIOL 3122, Tropical Resource Ecology
BIOL 3123, Tropical Resource Ecology Field Studies
BIOL 3145, Tropical Vertebrate Ecology
BIOL 3182, Introduction to Marine Science
BIOL 4102, Behavioral Ecology
BIOL 4112, Evolution of Animal Sociality
BIOL 4182, Population Biology
BIOL 4202, Wildlife Ecology and Conservation
BIOL 4203, Wildlife Ecology and Conservation Laboratory
BIOL 4245, Field Biology
BIOL 4402, Ornithology
BIOL 4403, Ornithology Laboratory
BIOL 4422, Entomology
BIOL 4423, Entomology Laboratory
BIOL 4501, Flowering Plant Families: Phylogeny and Diversification

Economics

ECON 3300, International Economic Analysis
ECON 3301, Intermediate Economic Theory: Microeconomics
ECON 4550, Natural Resource Economics

History

HIST 3000, Selected Topics, when relevant

Political Science

POL SCI 3480, Environmental Politics
POL SCI 3590, Studies in Comparative Politics, when relevant
POL SCI 3850, International Organizations and Global Problem Solving
POL SCI 4510, Comparative Public Policy and Administration

Social Work

SOC WK 3900, Seminar in Social Work, when relevant Sociology
SOC WK 3420, World Population and Ecology
SOC WK 4470, Demographic Techniques