

Additional information may be obtained from:

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St. Louis, Missouri 63121-4400
(314) 516-5451
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University of Missouri-St. Louis

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 B.A. or B.S. in biology; and, in cooperation with the College of Education, offers the B.S. in secondary education with a major in biology and the B.A. or B.S. 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 chairperson of the Biology Department.

Graduate Studies

The Biology Department also offers work leading to the M.S. and Ph.D. degrees in biology.

Facilities

Department facilities include research and teaching laboratories, environmental chambers, greenhouses, animal care rooms, and a large 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. CEIBA 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, St. 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 Biology 4889, Senior Seminar, and Biology 4905, Research.

Degree Requirements

Bachelor of Arts in Biology

The B.A. 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:

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

One of the following diversity courses:

2402, Vertebrate Biology **or**
2442, Invertebrate Biology **or**
2482, Microbiology **or**
2501, Biology of Plants **or**
4402, Ornithology **or**
4422, Entomology **or**
4482, Parasitology **or**
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.

CAREER

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 Biology 4905 can be used to fulfill one laboratory requirement. Students may take Chemistry 4733 to satisfy one of these laboratory course requirements, but students may not use both Biology 4713 and Chemistry 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

Eng 3100, Advanced Expository Writing **or**
Eng 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 B.S. 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 B.S. 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 B.S. 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 UM-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 B.S. degree must successfully complete the same basic courses as those for the B.A. 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 Biology 4905 can be used to fulfill one laboratory requirement. Students may take Chemistry 4733 to satisfy one of these laboratory course requirements, but students may not use both Biology 4713 and Chemistry 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 (Biology 4905). Biology 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

Statistics 1310, Elementary Statistical Methods, or
Statistics 1320, Applied Statistics I, or Education 5730,
Educational Statistics, or Psychology 2201,
Psychological Statistics, or Biology 4122, Biometry.

Set B. Computer Science

Comp Sci, 1010, Introduction to Computing and the Internet
Comp Sci, 1250, Introduction to Computer Science
Bus 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:

Communication 1040, Introduction to Public Speaking
English 3100, Advanced Expository Writing or
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
Chemistry 1111, Introductory Chemistry I, (or Chemistry 1082, General Chemistry I, plus Chemistry 1091, General Chemistry II)
Chemistry 1121, Introductory Chemistry II
Chemistry 2612, Organic Chemistry I
Chemistry 2622, Organic Chemistry II
Chemistry 2633, Organic Chemistry Laboratory, or Chemistry 2223, Quantitative Analysis
Philosophy 3380, Philosophy of Science or Philosophy 2256, Bioethics
Mathematics 1030, College Algebra, and Mathematics 1035, Trigonometry
Mathematics 1100, Basic Calculus, or Mathematics 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, Biology 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:

1081, Global Ecology
1102, Human Biology
1131, Human Physiology and Anatomy I
1141, Human Physiology and Anatomy II
1162, General Microbiology
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 B.S.Ed. 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 B.A. degree with the exception that Biology 4985, Methods of Teaching Biology in Secondary Schools, and Biology 4986, Laboratory in Teaching Life Science, are substituted for Biology 4889, Senior Seminar. Students must also fulfill the requirements for the B.S.Ed. 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 B.A. or B.S. with certain prescribed courses in biology, with the exception of Biology 4889, Senior Seminar, and in addition, completing the following courses:

Psychology 1003, General Psychology
Ed Fnd 1111, The School in Contemporary Society

English 3160, Writing in the Sciences
History 1001, 1002, or 1003, American Civilization
Pol Sci 1100, Introduction to American Politics
Philosophy 3380, Philosophy of Science
Communication 1040, Introduction to Public Speaking
Theater 1210, Fundamentals of Acting
Geology 1001, General Geology
Atmospheric Science 1001, Elementary Meteorology
Ed Psy 3312, The Psychology of Teaching and Learning
Ed Tec 2248, Utilization of Computer-Based Materials in Instruction
Teh Ed 3310, Introduction to Instructional Methods
Sec Ed 3213, Techniques of Secondary School Teaching and Field Study
Sp Ed 3313, The Psychology and Education of Exceptional Individuals
Sec Ed 4391, Teaching Reading in Secondary School

Content Areas

Biology 4985, Curriculum and Methods of Teaching Life Sciences
Biology 4986, Laboratory in Teaching the Life Sciences
Sec Ed 3290, Secondary School Student Teaching
Biology 4999, Science Teaching Intern Seminar

Since specific biology courses are required for teaching endorsement, contact the Department of Biology **AND** the 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 UM-St. Louis.

Requirements are:

1. Biology 1811 and Biology 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. This program must be approved by the chairperson of the Department of Biology.

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.

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 a **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 B.S. 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:

2482, Microbiology
2483, Microbiology Laboratory
3642, Development
4602, Molecular Biology
4612, Molecular Genetics of Bacteria
4614, Biotechnology Laboratory I
4622, Molecular Cell Biology
4632, Nucleic Acid Structure and Function
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 B.S. 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 UM-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 Biology Department. 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

2102, General Ecology
3202, Conservation Biology

3203, Conservation Biology Laboratory
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

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

Biology

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

Economics

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

History

3000, Selected Topics, when relevant

Political Science

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

Social Work

3900, Seminar in Social Work, when relevant

Sociology

3420, World Population and Ecology
4470, Demographic Techniques

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