

Biology BA

The B.A. 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 core courses and general education requirements as those seeking the Bachelor of Science degree, but with less emphasis on science electives and more emphasis on liberal arts.

General Education Requirements

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

Candidates for the B.A. degree must fulfill the foreign language requirement of the College of Arts and Sciences. There is no foreign language requirement for the B.S. degree.

Satisfactory/Unsatisfactory Option

Up to 18 credit hours may be taken on a satisfactory/ unsatisfactory (s/u) basis. Excluded from this option are required courses in biology, chemistry, physics, and mathematics.

Non-major Biology Courses

The following 1000 level biology courses do not count toward the biology credit hours required for a major in biology. Moreover, if biology majors take these courses, they are treated as biology courses when computing the 70 credit hours outside of biology needed to be included in the 120 total credit hours required for graduation.

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|-----------|--|---|
| BIOL 1012 | General Biology: The Science of Life (MOTR BIOL 100) | 3 |
| BIOL 1013 | General Biology Laboratory: The Science of Life | 1 |
| BIOL 1102 | Human Biology (MOTR LIFS 150) | 3 |
| BIOL 1131 | Human Physiology and Anatomy I | 4 |
| BIOL 1141 | Human Physiology and Anatomy II | 4 |
| BIOL 1110 | Nutrition in Health | 3 |
| BIOL 1150 | Concepts in Health and Wellness | 3 |
| BIOL 1162 | General Microbiology | 3 |
| BIOL 1202 | Environmental Biology | 3 |

Degree Requirements

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 the life sciences. Candidates must have a cumulative grade point average of 2.0 or better in biology courses. Candidates must also earn a minimum grade of C- in all core courses.

All B.A. degree majors must take at least 40 credit hours, but not more than 50 hours, in appropriate biology course work. A minimum of 18 hours at or above the 2000 level (including one laboratory) must be taken in residence in the UMSL Department of Biology in order to receive a B.A. degree from the College of Arts and Sciences with a major in biology.

Lecture and Seminar Course Requirements

The following biology courses or their equivalents are required:

Core

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|-----------|--|---|
| BIOL 1800 | Introduction to the Biology Major | 1 |
| BIOL 1821 | Introductory Biology: Organisms and the Environment (MOTR BIOL 150LEC) | 5 |
| BIOL 1831 | Introductory Biology: From Molecules to Organisms (MOTR BIOL 150L) | 5 |
| BIOL 2012 | Genetics | 3 |
| BIOL 3302 | Evolution | 3 |
| BIOL 3622 | Cell Biology | 3 |

Capstone 2-3

Select one of the following:

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|-------------|--|
| BIOL 4889 | Senior Seminar |
| SEC ED 4985 | Curriculum and Methods of Teaching Life Sciences |

Total Hours 22-23

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. Biochemistry CHEM 4712 can also be used toward satisfying this requirement.

At least two of these courses 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. 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 3699, BIOL 4299, BIOL 4905, or BIOL 4915 (no combination of these courses allowed) 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.

Communication Skills

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

Foreign Language

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|---|---|
| The foreign language requirement of the College of Arts & Sciences fulfills the departmental requirement. | 3 |
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Writing

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|--------------|--|---|
| ENGL 3160 | Writing in the Sciences (strongly preferred) | 3 |
| or ENGL 3100 | Junior-Level Writing | |

Total Hours 6

Associated Science Area

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

| | | |
|---------------|----------------------------|---|
| PHYSICS 1011 | Basic Physics I | 3 |
| PHYSICS 1011L | Basic Physics I Laboratory | 1 |

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|---|--|--------------|
| PHYSICS 1012 | Basic Physics II | 3 |
| PHYSICS 1012L | Basic Physics II Laboratory | 1 |
| CHEM 1111 | Introductory Chemistry I (MOTR CHEM 150L) | 5 |
| CHEM 1121 | Introductory Chemistry II | 5 |
| CHEM 2612 | Organic Chemistry I | 3 |
| MATH 1030 | College Algebra (MOTR MATH 130) | 3 |
| MATH 1100 | Basic Calculus | 3-5 |
| or MATH 1800 | Analytic Geometry and Calculus I | |
| Select one of the following advanced Chemistry courses: | | 2-3 |
| CHEM 2223 | Quantitative Analysis in Chemistry | |
| CHEM 2622 | Organic Chemistry II | |
| CHEM 2633 | Organic Chemistry Laboratory | |
| BIOL 4732 | Principles of Biochemistry | |
| Select one of the following statistics options: | | 3-4 |
| BIOL 4122 | Biostatistics | |
| MATH 1320 | Introduction to Probability and Statistics | |
| Total Hours | | 32-36 |

Research Opportunity

Students in the B.A. Biology degree program who are interested in gaining research experience are encouraged to take a minimum of 2 credit hours of undergraduate research, BIOL 4905. The privilege of doing undergraduate research provides students with a first-hand 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 and a presentation, all based on an average 8 hr. per week per credit hour for a 15 week semester.

Thesis in Biology Research and the Degree with Distinction

The Department of Biology offers high-achieving students the opportunity to present primary research in the form of a written thesis and to graduate with a Degree with Distinction in Biology. The first step in conducting an undergraduate thesis is to identify a faculty research mentor with whom you can conduct novel research. The mentor, along with two UMSL faculty members, will be readers of the thesis. Students need a minimum of two semesters, usually more, to conduct research. After students have identified a research mentor and have completed 75 credit hours, they may apply for a Degree with Distinction in Biology. The final thesis will be written in the form of a scientific manuscript and presented orally in an advertised public forum at least 6 weeks prior to commencement. The readers of the thesis will decide if the thesis merits a Degree with Distinction, and will report their recommendation to the Dean of Arts and Sciences. In addition to fulfilling the coursework required for a B.S. or B.A. in Biology and the thesis itself, students must also fulfill all the requirements for UMSL's Degree with Distinction.

Academic Tracks within the Major of Biology

Biology majors may choose to focus their elective hours in a particular sub-discipline of biology, or academic track. These tracks are groups of departmental courses that fit within sub-disciplines of biology and are recommendations for students wanting to pursue careers in specific sub-disciplines. Academic tracks are NOT majors and are only intended to serve as guides for courses within a particular area of biology and

are represented by current faculty expertise. Selecting an academic track does not prevent a student from taking courses in another track. Students should not expect to take all recommended courses for each academic track. Students may choose not to select an academic track. Currently, the Biology Department offers three academic tracks: Cell and Molecular Biology; Ecology, Evolution and Conservation Biology; and Pre-professional/Health Sciences.

Cell and Molecular Biology Track

| | | |
|-----------|---|---|
| BIOL 2482 | Microbiology | 3 |
| BIOL 2483 | Microbiology Laboratory | 2 |
| BIOL 4442 | Developmental Biology | 3 |
| BIOL 4550 | Bacterial Pathogenesis | 3 |
| BIOL 4602 | Molecular Biology | 3 |
| BIOL 4614 | Biotechnology Laboratory I | 4 |
| BIOL 4615 | Biotechnology Laboratory II | 4 |
| BIOL 4622 | Cellular Basis of Disease | 3 |
| BIOL 4632 | Nucleic Acid Structure and Function | 3 |
| BIOL 4642 | Plant Molecular Biology and Biotechnology | 3 |
| BIOL 4652 | Virology | 3 |
| BIOL 4732 | Principles of Biochemistry | 3 |
| BIOL 4713 | Techniques in Biochemistry | 2 |
| BIOL 4842 | Immunobiology | 3 |

Ecology, Evolution and Conservation Biology Track

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|-----------|---------------------------------|---|
| BIOL 2102 | Ecology | 3 |
| BIOL 2103 | Ecology Laboratory | 2 |
| BIOL 2402 | Vertebrate Anatomy | 3 |
| BIOL 2403 | Vertebrate Anatomy Laboratory | 2 |
| BIOL 2482 | Microbiology | 3 |
| BIOL 2483 | Microbiology Laboratory | 2 |
| BIOL 3102 | Animal Behavior | 3 |
| BIOL 3103 | Animal Behavior Laboratory | 2 |
| BIOL 3202 | Conservation Biology | 3 |
| BIOL 3203 | Conservation Biology Laboratory | 2 |
| BIOL 3802 | Vertebrate Physiology | 3 |
| BIOL 3803 | Vertebrate Physiology Lab | 2 |
| BIOL 4102 | Behavioral Ecology | 3 |
| BIOL 4122 | Biostatistics | 3 |
| BIOL 4182 | Population Biology | 3 |
| BIOL 4299 | Practicum in Conservation | 2 |
| BIOL 4402 | Ornithology | 3 |
| BIOL 4403 | Ornithology Laboratory | 2 |
| BIOL 4422 | Entomology | 3 |
| BIOL 4423 | Entomology Laboratory | 2 |

Pre-professional/Health Sciences Track

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|-----------|-------------------------------|---|
| BIOL 2402 | Vertebrate Anatomy | 3 |
| BIOL 2403 | Vertebrate Anatomy Laboratory | 2 |
| BIOL 2482 | Microbiology | 3 |
| BIOL 2483 | Microbiology Laboratory | 2 |
| BIOL 3802 | Vertebrate Physiology | 3 |
| BIOL 3803 | Vertebrate Physiology Lab | 2 |
| BIOL 4442 | Developmental Biology | 3 |
| BIOL 4550 | Bacterial Pathogenesis | 3 |

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|-----------|------------------------------|---|
| BIOL 4602 | Molecular Biology | 3 |
| BIOL 4622 | Cellular Basis of Disease | 3 |
| BIOL 4652 | Virology | 3 |
| BIOL 4732 | Principles of Biochemistry | 3 |
| BIOL 4822 | Introduction to Neuroscience | 3 |
| BIOL 4842 | Immunobiology | 3 |

B.S. Ed. in Secondary Education with Emphasis in Biology

The B.S. Ed. is a professional education degree designed for students who wish to pursue a teaching career in secondary schools. Much of the discipline-specific coursework parallels the B.A. or B.S. degree in the discipline; however, the Missouri Department of Elementary and Secondary Education (DESE) requires specific coursework for teacher certification. Therefore, students interested in the B.S. Ed. should contact the advising office (OASIS) 314-516-5937 in the College of Education for discipline-specific requirements. *Note: To obtain teaching certification, DESE requires a 3.0 GPA in the discipline and professional education coursework, as well as a 2.75 GPA overall.*

B.A. or B.S. in Biology with Master's Level Coursework for Secondary Teacher Certification

In addition to the B.S. Ed., students may opt to complete a B.A. or B.S. degree in their discipline as an undergraduate, followed by admission to the Graduate School for Master's level teaching certification. The College of Education has a one-year accelerated program for post-graduate certification called Teach in 12, or students can choose a traditional path to certification. Graduate coursework for certification can apply towards a Master's Degree in Secondary Education, with additional coursework. Students interested in Master's Level teacher certification should contact the advising office (OASIS) 314-516-5937 in the College of Education. *Note: To obtain teaching certification, DESE requires a 3.0 GPA in the discipline and professional education coursework, as well as a 2.75 GPA overall.*

Learning Outcomes

Integrative Knowledge

Graduates will demonstrate a clear understanding of the overriding principles and theorems within and between the content areas of anatomy, botany, cytology, ecology, evolutionary biology, microbiology, physiology, and zoology. Specifically, graduates will demonstrate competency in the following areas:

- Structure and function of the basic biological units of living organisms
- Information flow, exchange and storage from parent to offspring or from parent cells to progeny cells.
- Pathways and transformations of energy and matter that govern metabolism
- Systems that govern interactions between organisms or between organisms and their environment
- Biodiversity at the genetic, organismal, community, and global scales
- Evolution, common ancestry, and changes to biological populations over successive generations.

Laboratory Skills

Scientists not only learn the results of others, they work in the lab to generate new knowledge. Graduates will demonstrate basic skills associated with performing laboratory experiments or field studies in biology following a broad introduction of commonly used equipment and procedures.

Critical Thinking Skills

Graduates will be able to formulate meaningful hypotheses, design experiments to test them, and evaluate data critically, including an appreciation of the potential sources of error associated with laboratory measurements and troubleshooting technical issues.

Scientific Literacy

Graduates will be able to identify the need for information, procure the information from relevant scientific literature publications and databases, and critically evaluate reliability, validity, accuracy, authority, timeliness, and point of view or bias.

Communication Skills

Scientists not only must be able to solve problems, they also must be able to communicate those solutions to others. Graduates of this program demonstrate how to present scientific concepts and information in a clear and accurate manner. Specifically, graduates will be able to write scientific reports and make effective oral presentations of their results and ideas.

Professional and Research Ethics

Graduates will honestly and objectively evaluate and report data in an ethical and legal manner to promote the values that are essential to scholarly work: trust, accountability, mutual respect, and fairness. By doing so, graduates will come to understand and respect the accepted standards of conduct associated with the scientific profession regarding citation, use of privileged information, integrity of data, and authorship.

Foreign Language

B.A. graduates will demonstrate basic proficiency in speaking, listening, writing and reading in a language in addition to English.

Sample Four Year Plan

| First Year | | | |
|-------------------------------------|-------|--|-------|
| Fall | Hours | Spring | Hours |
| INTDSC 1003 ¹ | | 1 BIOL 1821 | 5 |
| BIOL 1800 | | 1 CHEM 1111 | 5 |
| ENGL 1100 | | 3 MATH 1035 | 2 |
| MATH 1030 | | 3 CORE - Communication Proficiency | 3 |
| CORE- US History & Government | 3 | | |
| EXPLORE - Social Sciences | 3 | | |
| | 14 | | 15 |
| Second Year | | | |
| Fall | Hours | Spring | Hours |
| BIOL 1831 | | 5 BIOL 2012 | 3 |
| CHEM 1121 | | 5 BIOL 2013 | 2 |
| MATH 1100 | | 3 CHEM 2612 | 3 |
| EXPLORE - Humanities and Fine Arts | | 3 MATH 1320 | 3 |
| | | EXPLORE - Social & Behavioral Sciences | 3 |
| | 16 | | 14 |
| Third Year | | | |
| Fall | Hours | Spring | Hours |
| BIOL 2000+ Biology Lecture Elective | | 3 BIOL 2000+ Biology Lecture Elective | 3 |

| | | |
|--|-------------------------|-----------|
| BIOL 2000+ Biology Laboratory Elective | 2 PHYSICS 1012 | 3 |
| BIOL 3302 | 3 PHYSICS 1012L | 1 |
| BIOL 4732, CHEM 2223, CHEM 2622, CHEM 2633, or CHEM 4712 | 3 ENGL 3160 | 3 |
| PHYSICS 1011 | 3 Foreign Language 1001 | 5 |
| PHYSICS 1011L | 1 | |
| | 15 | 15 |

Fourth Year

| Fall | Hours | Spring | Hours |
|--|--------------|---|--------------|
| BIOL 3622 | | 3 BIOL 4889 | 2 |
| BIOL XXXX Biology Diversity Elective | | 3 BIOL 4XXX 4000-Level Biology Lecture Elective | 3 |
| BIOL 2000+ Biology Laboratory Elective | | 2 Foreign Language 2101 | 3 |
| FGN LANG 1002 | | 5 Cultural Diversity Requirement | 3 |
| EXPLORE - Humanities and Fine Arts | | 3 EXPLORE - Humanities and Fine Arts | 3 |
| | | EXPLORE - Social Sciences | 3 |
| | 16 | | 17 |

Total Hours: 122**1**

INTDSC 1003 is required only for first-time freshmen and transfer students with less than 24 college credits.

Please Note: This plan is an example of what a four year plan could look like for a typical student. Placement exam scores in math as well as the completion of coursework may change the plan. It should not be used in the place of regular academic advising appointments. All students are encouraged to meet with their advisor each semester. All requirements are subject to change.