

Biology, PhD

The doctoral program emphasizes empirical and theoretical approaches to biological research. Students are required to integrate basic skills in biology with focal studies in an emphasis area. The program is designed to provide research experience and training appropriate for advanced positions in academic research and teaching, government and public agencies, and industry.

Admission Requirements

Applicants must meet the general graduate admission requirements of the Graduate School, described in the UMSL catalog. Students are considered for admission to the graduate program in Biology only after they have formally applied for admission through the Graduate School. Applications may be completed on-line.

~~Applicants~~ In addition to Graduate School admission requirements, applicants to the Ph.D. program must submit a formal application to the Graduate Admissions Office including, three letters of recommendation submitted from individuals able to comment on academic potential (such as faculty members at previously attended colleges or universities,) and transcripts of all postsecondary academic work. We encourage GRE scores (Verbal, Quantitative, and Analytical) to be sent as well; however, these are not required. Admission to the Ph.D. program normally requires a minimum grade point average overall and in biology courses of 3.0 (where A=4.0). Applicants from countries where English is not a primary language are required to ~~take meet~~ the ~~TOEFL examination~~ language requirements set by UMSL Global. Scores must be submitted before admission can be decided. ~~Ordinarily, a score of 550 or better is required.~~

Applicants should have a bachelor's or M.S. degree from an accredited United States college or university or evidence of equivalent training at an accredited institution outside the United States. They should have the appropriate background for graduate work in biology, including courses in genetics, biochemistry, and evolution. Courses in organic chemistry, college physics, and calculus are expected. ~~A course in statistics is recommended.~~ Students admitted to the Ph.D. program who have not met all the prerequisites may be required to make up deficiencies before admission to candidacy. The deficiencies will be decided during orientation meetings prior to the start of the second semester. ~~Three credits of BIOL 4920 Selected Topics can be given to graduate students for BIOL 2012 or~~

~~BIOL 3302 if they received a grade of B or better for all undergraduate course work and complete a graduate-level paper assigned by the instructor. Instructor consent is required.~~

Degree Requirements

In addition to the general requirements of the Graduate School, the basic requirements for the Ph.D. degree in Biology include 60 graduate credit hours. At least 30 of the 60 hours must be taken at the 5000 or 6000 level. With the explicit consent of the **advisory graduate** committee, students may take for graduate credit up to 3 credit hours of 3000 level courses in allied departments. ~~All students are required to take BIOL 5178, Introduction to Graduate Research in Biology, and BIOL 5179, Ethical Issues in Biology.~~ Courses in biology at the 3000 level and below are not available for graduate credit. At least 31 of the 60 hours must be taken while in residence at the University of Missouri-St. Louis. Graduate credit for course work transferred from another program is subject to approval by the graduate committee and by the Graduate School. Graduate courses taken elsewhere will be considered for transfer credit during orientation meetings conducted prior to the start of the second semester of enrollment.

The requirements for all Ph.D. students include:

Coursework

- At least 30 **hours** credits of course work, including the following required courses (20 credits total):
 - ~~○ At least 6 credits of BIOL 6889, Graduate Seminar~~
 - ~~○ One credit each of BIOL 5178, Introduction to Graduate Research in Biology, and BIOL 5179, Ethics in Biology (to be taken the first year)~~

BIOL 6889	Graduate Seminar	6
BIOL 5178 & BIOL 5179	Introduction to Graduate Research in Biology and Ethical Issues in Biology (to be taken in first year)	2
BIOL 5436	Advanced Applied Bioinformatics	3
BIOL 4122	Biostatistics	3
BIOL 5012	Advanced Genetics	3
BIOL 5302	Advanced Evolution	3
Total Hours		20

The maximum number of credit hours that may be applied toward the 60-hour requirement is limited as stated below:

- BIOL 6889, Graduate Seminar: 10 hours
- BIOL 6905, Graduate Research: 30 hours

~~A combination of 6 total credit hours of the following:~~

- ~~• BIOL 5059, Topics in Ecology, Evolution, and Systematics~~
- ~~• BIOL 5069, Topics in Cellular and Molecular Biology~~
- ~~• BIOL 5079, Topics in Floristic Taxonomy~~
- ~~• BIOL 5089, Topics in Animal Behavior~~
- ~~• BIOL 5099, Biology Colloquium~~

The department also offers five 1-credit journal-club-style classes, focusing on different topics. A maximum of six credits from this group of courses can be applied towards the degree:

BIOL 5059	Topics in Ecology, Evolution, and Systematics	1
BIOL 5069	Topics in Cellular and Molecular Biology	1
BIOL 5079	Topics in Floristic Taxonomy	1
BIOL 5089	Topics in Animal Behavior	1
BIOL 5099	Biological Colloquium	1

Emphasis areas

Each Ph.D. student ~~is associated either with the Cellular and Molecular Biology (CMB) emphasis area, or the Ecology, Evolution and Systematics (EES) emphasis area. Each of these areas has its own course requirements in addition to the University-wide and department-wide requirements listed above~~ should select one of three emphasis areas, and choose at least six credit hours of appropriate elective courses to fit this area in consultation with their advisor. These emphases include Ecology, Evolution, and Behavior (EEB), Cellular and Molecular Biology (CMB), or Integrative Biology (IB), which would involve a combination of coursework from both of the previous emphases. Other courses may be included as electives with prior approval of the program coordinator.

Ecology, Evolution and Behavior

BIOL 5192	Community Ecology	3
BIOL 5312	Theory of Systematics	3
BIOL 6102	Advanced Topics in Behavioral Ecology	3
BIOL 6182	Advanced Population Biology	3
BIOL 6270	Advanced Global Climate Change	3
BIOL 6502	Advanced Evolution of Cognition	3

Cellular and Molecular Biology Electives

BIOL 6442	Advanced Developmental Biology	3
BIOL 6550	Advanced Bacterial Pathogenesis	3
BIOL 6602	Advanced Molecular Biology	3
BIOL 6608	Advance Synthetic Biology	3
BIOL 6615	Advanced Biotechnology Laboratory II	4
BIOL 6622	Advanced Cellular Basis of Disease	3
BIOL 6632	Advanced Nucleic Acid Structure and Function	3
BIOL 6642	Advanced Plant Biology and Biotechnology	3
BIOL 6652	Advanced Virology	3

Integrative Biology Electives

BIOL 5192	Community Ecology	3
BIOL 5312	Theory of Systematics	3
BIOL 6102	Advanced Topics in Behavioral Ecology	3
BIOL 6182	Advanced Population Biology	3
BIOL 6270	Advanced Global Climate Change	3
BIOL 6502	Advanced Evolution of Cognition	3
BIOL 6608	Advance Synthetic Biology	3
BIOL 6615	Advanced Biotechnology Laboratory II	4
BIOL 6622	Advanced Cellular Basis of Disease	3
BIOL 6632	Advanced Nucleic Acid Structure and Function	3
BIOL 6642	Advanced Plant Biology and Biotechnology	3
BIOL 6652	Advanced Virology	3

Maintenance of Status

All students are expected to maintain a GPA of 3.0 or better. ~~Students will normally meet formally with their thesis committee, or if that has not been formed,~~

~~with their advisor each year to maintain their status in the program.~~ To maintain their status in the program, normally students will meet formally each year with their thesis committee, or if that has not been formed yet, with their dissertation advisor.

~~First-Year Experience~~

~~Ph.D. students in the Cellular and Molecular Biology emphasis area typically rotate through three different labs during their first semester before choosing/being accepted by a particular dissertation advisor. Ph.D. students in the Ecology Evolution and Systematics emphasis area typically are accepted by a particular dissertation advisor as part of the Ph.D. program application/acceptance process. All students are expected to become involved in research by the spring semester of their first year.~~

Identifying a Dissertation Advisor

All PhD students must identify a dissertation advisor, via mutual consent between the student and the advisor. Students entering the program with an agreement in hand may join the lab in their first semester (this is more common for the EEB emphasis). Alternatively, students entering the program may rotate through three labs to identify a permanent lab and advisor (more common for the CMB emphasis). Additionally, students are expected to work with their advisor to assemble their dissertation committee by the end of the 2nd year.

In the event that a student's interest changes or the dissertation advisor feels the student's direction no longer falls with his/her area of expertise, the student and advisor should discuss whether a change of advisor is warranted. The graduate director must be notified in writing of any change in advisors. If a student or advisor is uncomfortable discussing the issue directly with the other, he/she is encouraged to meet with the director of the graduate program. If a student is unable to identify an advisor, they may be dismissed from the PhD program, typically with the option of completing an MS degree.

Qualifying Examination

~~All students must pass a qualifying examination consisting of a written and oral component. Students beginning studies in the fall semester will normally take the qualifying examination at the end of their fourth semester of full-time study. Doctoral students who have earned an M.S. degree previously are encouraged to take the examination in their first year.~~

All students must pass a qualifying examination, consisting of a written and oral components, which will normally be taken in the fall semester of the third year of

graduate school. When a candidate has prior graduate experience or an especially strong undergraduate preparation, the examination may be taken earlier. Alternatively, those who require extra time due to a high load of language classes or missing prerequisite courses may petition for a one-time extension.

~~The examination for Ecology, Evolution and Systematics students evaluates knowledge of fundamental principles presented in formal courses and in papers of special importance in the field. The written exam will be given in December at the end of the third semester, and the oral portion immediately afterwards.~~

~~The Qualifying Examination for Cellular and Molecular students is composed of a written portion in which the student prepares a formal research proposal on a topic different from that of her/his doctoral dissertation research, and an oral portion during which the student defends the research proposal as well as his/her knowledge of the fundamental concepts of molecular biology, cell biology, and biochemistry.~~

Admission to Candidacy

To be admitted to candidacy, students must satisfy the requirements of the Graduate School, which includes passing all qualifying examinations and completing all required course work.

Dissertation Proposal

All students must defend orally a written dissertation proposal to their dissertation committee. ~~The approved~~ After successful defense, the proposal must be submitted to the director of graduate studies in biology and approved by the Graduate School. ~~Doctorial students may not enroll in more than 4 credits of graduate research (BIOL 6905) before they have received approval for their dissertation proposal.~~ The proposal is to be successfully defended by the end of the sixth semester.

Dissertation

A dissertation embodying the results of original research shall be submitted to and approved by the Department of Biology and the Graduate School. The general regulations of the Graduate School concerning the preparation of the dissertation must be met. These rules include a public oral defense of the written dissertation. Dissertations are to be presented in a style appropriate for one or more publications in scientific journals.

Teaching

At least one semester of supervised teaching is required of all doctoral students.

Justification for request:

We are updating our PhD program in response to CAP. Previously, the coursework for our two emphasis areas was quite divided, but we are updating the program with a larger set of common courses for all PhD students, then a set of electives within the emphasis areas. We are also updating one of our emphasis area names to Ecology, Evolution and Behavior (instead of Ecology, Evolution and Systematics) to be more in line with the training and coursework provided in that area, and we are adding a third emphasis area (Integrative Biology) for the increasing number of students that do research crossing the bridge between our other two emphasis areas.