

# PhD in Biology

## Doctor of Philosophy in Biology

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.

### Ph.D. Admission Requirements

Applicants to the Ph.D. program must submit a formal application to the Graduate Admissions Office. In addition, the applicant should arrange to have sent: three letters of recommendation from faculty members at previously attended colleges or universities, GRE scores (Verbal, Quantitative, and Analytical), and transcripts of all postsecondary academic work. 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 the TOEFL examination. 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 receive 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.

### Ph.D. 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 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:

- 30 hours of course work, including:
  - At least 6 credits of **BIOL 6889, Graduate Seminar**
  - One credit ~~of~~ each of **BIOL 5178, Introduction to Graduate Research in Biology** and **BIOL 5179, Ethics in Biology** (to be taken the first semester)
  - ~~BIOL 4122, Biometry, or an equivalent undergraduate course in statistics. This requirement is normally waived if the student has already taken an undergraduate course in statistics and received a B- or higher. Bioinformatics can also be substituted for BIOL 4122 Biometry.~~

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**

## Emphasis area requirements

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.

Ecology, Evolution and Systematics <sup>1</sup>		
BIOL 4122	Biometry	3
Select three of the following:		9
BIOL 5302	Advanced Evolution	
BIOL 5312	Theory Of Systematics	3
BIOL 6182	Advanced Population Biology	3
BIOL 5192	Community Ecology	3
Cellular and Molecular Biology		
<del>Select three of the following:<sup>1</sup></del>		
<del>BIOL 6602</del>	<del>Advanced Molecular Biology</del>	
<del>BIOL 6612</del>	<del>Advanced Molecular Genetics Of Bacteria</del>	
<del>BIOL 6615</del>	<del>Advanced Biotechnology Laboratory II</del>	
<del>BIOL 6622</del>	<del>Advanced Cellular Basis of Disease</del>	
<del>BIOL 6632</del>	<del>Advanced Nucleic Acid Structure And Function</del>	
<del>BIOL 6642</del>	<del>Advanced Plant Biology And Biotechnology</del>	
BIOL 5436	Applied Bioinformatics	3

<sup>1</sup> An equivalent graduate level course at another university may be substituted for one of the required courses, if approved by the Graduate Director

## 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.

## **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.

## **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.

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 ~~April~~ **December** at the end of the ~~spring~~ **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 proposal must be submitted to the director of graduate studies in biology. Doctoral 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.

Sign-offs from other departments affected by this proposal

None

Rationale

These are the changes that the Biology graduate committee has approved. They include a change in the timing for the qualifying exam and an update of the core courses needed in both emphasis areas (EES and CMB).