

BIOLOGY, PH.D.

The Doctor of Philosophy (Ph.D.) in Biological Sciences is a research-intensive degree designed to prepare students for advanced careers in the life sciences in the biological sciences. Students are required to conduct their own independent research in order to complete a comprehensive dissertation, while also completing the required coursework leading to a Ph.D. in Biological Sciences.

Admissions

Most successful applicants will contact potential faculty mentors during the application process. The departmental website lists faculty and provides a link to individual pages that describe their research interests.

Before entering graduate study in the Biological Sciences, the applicant is expected to have substantial knowledge of chemistry, mathematics, and physics, and to have completed basic courses in the biological sciences with high standards of scholarship. In general, a curriculum equivalent to that required of undergraduate majors in the Department of Biological Sciences is expected. Students admitted without this background may be required to make up course deficiencies without receiving graduate credit.

See the Admission Criteria section of this catalog for more information.

Curricular Requirements

Coursework and Requirements for Ph.D. Students (66 credit hours)

Code and Title	Hours
Dissertation Research	18
BSC 699 Dissertation Research	
Required Courses ¹	11
BSC 505 Intro to Grad Studies	
BSC 601 Biological Sciences Seminar (required each semester in residence at the Tuscaloosa campus)	
Elective Courses	37
BSC 500 Vertebrate Funct Morphol	
BSC 507 Research Tech In By	
BSC 511 Phage Discovery Laboratory	
BSC 512 Limnology	
BSC 515 Wetland Ecology	
BSC 516 Disease Ecology	
BSC 517 Environmental Modeling	
BSC 519 Evolutionary Genomics	
BSC 520 Principles Of Systematics	
BSC 521 Pers Gen Med	
BSC 522 Biology of Cancer	
BSC 524 Human Physiology	
BSC 525 Human Physiology Lab	
BSC 526 Computational Biology Lab	
BSC 528 Biology Of Fishes	
BSC 530 Introduction to Pharmacology	
BSC 531 Pathogenic Microbiology	
BSC 534 Plant Systematics	
BSC 535 Immunology	
BSC 539 Bch/Molecular Biology Lab	
BSC 541 Developmental Biology	

BSC 542	Integrated Genomics
BSC 544	General Virology
BSC 548	Animal Behavior
BSC 549	Endocrinology
BSC 550	Fundamentals of Biochemistry
BSC 551	Bch/Molecular Biology II
BSC 553	Biochemistry Lab
BSC 555	Chemical Ecology
BSC 556	Microbial Ecology
BSC 558	Drug Discovery Laboratory
BSC 564	Biology Of Algae
BSC 565	Principles Of Toxicology
BSC 569	Histology Of Vertebrates
BSC 571	Plant Physiology
BSC 573	Bioinformatics
BSC 575	General Entomology
BSC 576	Aquatic Insects
BSC 580	Plant Ecology
BSC 581	Foundations in Advanced Biostatistics with Applications to R
BSC 582	Conservation Biology
BSC 583	Evolution
BSC 585	Found Forest Res and Conserv
BSC 587	Biogeography
BSC 590	Stream Ecology
BSC 594	Signal Transduction Neuroby
BSC 607	Adv Research Tech In By
BSC 656	Microscopical Techniques
BSC 666	Disease Models and Mechanisms
BSC 675	Global Change Biology
BSC 695	Spec Topics Biolog Sci (Biochemistry Lab, Computational Biology, Molecular Ecology, Intro to Pharmacology, R-Programming and Data Mtg, Drug Discovery Lab, Microbiome in Disease & Health, Disease Ecology, Chemical Ecology, Experimental Design)

Footnotes

- ¹ 48 credit hours other than BSC 699 Dissertation Research, including:
- At least 39 credit hours with a letter grade (i.e., not Pass/Fail)
 - A maximum of 6 credit hours with a letter grade may be taken from BSC 507 Research Tech In By and up to 6 credit hours may be taken from BSC 607 Adv Research Tech In By
 - Up to 9 hours of Pass/Fail credit can be applied toward fulfillment of degree requirements. Pass/Fail hours can include up to a total of 4 credit hours of BSC 601 Biological Sciences Seminar
 - Of the 48 required credit hours, 24 must carry the BSC or MS designation.
 - BSC 599 Thesis Research may not be applied toward this degree.

Transfer Credit

Information on transfer credit.

Doctoral Plan of Study Requirement

Information on Doctoral Plan of Study

Comprehensive Exams

Preliminary Exams: Ph.D. students must pass both a Written Preliminary Exam and an Oral Preliminary Exam before candidacy is granted. Both Preliminary Exams should be completed by end of the fifth semester in the Graduate Program.

a. Written Preliminary Exam: The department uses two forms of the written exam. The advisor must approve which exam the student will take.

- Option 1 – Traditional -** The examination shall be arranged and administered by the major professor. Each member of the Ph.D. Advisory Committee shall contribute five questions. The outside member of the committee is encouraged but is not required to participate in the exam. However, if they do not, then the student's committee for the purpose of this exam must consist of at least 5 members from inside the department. The examination shall be administered over no more than 14 consecutive days with one day allowed for each set of questions. Each answer will be graded "Pass" or "Fail." Questions may involve intellectual synthesis as well as basic concepts. Each examiner will award grades without prior knowledge of the student's performance on other parts of the examination and report the results to the student's major professor within five days of the examination. The student must pass at least 19 of 25 questions, or 76% of the questions asked in cases of committees with more than five members.
- Option 2 – Proposal based -** The examination shall be arranged and administered by the major professor. Each member of the Ph.D. Advisory Committee shall contribute to the review of the proposal. The outside member of the committee is encouraged but is not required to review the proposal. However, if they do not, then the student's committee for the purpose of this exam must consist of at least 5 members from inside the department. Students will be expected to demonstrate the following:

- The ability to identify a substantive proposal topic
- The ability to formulate valid and testable hypotheses
- The ability to identify the importance of and justification for the proposed research, by preparing a comprehensive review of related research literature and presenting the proposed project in that context
- The ability to prepare a sound research plan that includes both appropriate techniques and approaches suitable for the testing of the hypotheses and alternative strategies and hypotheses.

The procedures for the proposal-based Written Preliminary Exam are:

- Students should submit to their committees one or more topics, as required by their committees, with a one-paragraph justification of the topic. The committee will approve proposal topics prior to initiation of proposal preparation. If a submitted topic is not acceptable, the student will be asked to revise and resubmit topics.
- The topics may be completely distinct from ongoing research in the student's lab, may build upon current or previous work in the lab, or may be related to the topic of the student's doctoral research, **as long as the proposed research demonstrates scientific independence and does not simply reproduce an experimental plan already proposed**

in the doctoral adviser's research grants or in the students dissertation research proposal.

- The term of the proposed research should be consistent with federal funding opportunities, contingent on committee approval.
- The proposal should be written following the format of research proposals. Failure to comply with any formatting requirement will result in return of the proposal to the student. Corrected copies must be resubmitted one day later.
- Students will have a maximum of two months to prepare the proposal after the committee's notification of topic selection.

Evaluation of the proposal will be based on the following considerations:

- Scope of the proposal (10%).** Is the research topic novel and important? Is the proposed project appropriate for the approved term (e.g. 3 years, 5 years)?
- Background (30%).** Is the literature survey comprehensive and appropriate? Does the literature survey identify a problem or series of problems that justifies the direction of the proposal?
- Experimental plan (40%).** Are there clearly stated hypotheses for each section, or at least clearly stated expectations of experimental outcomes? Are the proposed experiments appropriate tests of the hypotheses? Does the author have realistic expectations of the experimental methods? Are alternate hypotheses and experimental approaches proposed to cover the possibilities that: (i) the primary approaches prove to be inappropriate, (ii) the primary approaches disprove the hypotheses?
- Presentation (20%).** Is the proposal well organized and clearly written?

Each of the above evaluation criteria will be assigned a score of 1-5 as follows:

1. Outstanding 2. Excellent 3. Good/Average 4. Fair 5. Poor

An *average weighted cumulative score* of no greater than 3.0 must be earned in order to pass the proposal-based written exam.

For the written examination (either option), the student must demonstrate proficiency in technical writing. Note that if an answer is not formulated in a technically acceptable writing format it may be marked as a fail.

The Advisory Committee is expected to notify the student of their preliminary written exam score within 30 days after submission of the exam to the committee. *The submitted exam must be graded by the Ph.D. Advisory Committee. It is against program policy to permit a student to revise the submitted exam in any fashion prior to grading it.*

A student who fails the traditional written exam will be allowed to retake the entire examination (i.e., five questions from each committee member) once. Any second attempt must be made within three months of notification of failure of the first attempt. A student who fails the proposal-based written exam will be allowed to revise the proposal once. The revision must be submitted to the Ph.D. advisory committee within two months of notification of failure of the first attempt.

b. Oral Preliminary Exam:

To qualify to take the Oral Preliminary Exam the student must have passed the Written Preliminary Exam. The Oral Preliminary Exam will follow the written portion by not more than two weeks from the date of notification of passing the Written Preliminary Examination. It is a comprehensive examination intended to determine the student's knowledge of basic principles of biological sciences, as well as specific knowledge of the student's research area. When a student

has prepared a research proposal as their Written Preliminary Exam (Option 2), the student may be questioned on that proposal as well as on basic and specific information pertaining to their field of study. The student's entire Ph.D. Advisory Committee should attend the Oral Preliminary Exam and constitutes the voting committee regarding the passage or failure of the examination (virtual attendance is acceptable for outside members).

A student who fails the oral exam will be allowed to retake the examination once (within three months of the original exam) if they have not failed their written exam on the first attempt.

Any combination of 2 failed attempts at the written and/or oral examinations will lead to dismissal from the program. In other words, failing the written portion of the examination and subsequently failing the rewrite will lead to dismissal.

Similarly, failing the oral component and the subsequent re-examination would lead to dismissal. Likewise, failing both initial attempts at written and oral examinations will lead to dismissal.

Admission to Candidacy Requirements

The graduate student, the Department Chair, and the Dean of the Graduate School shall be notified by the major professor, in writing, of the results of the preliminary exam within a week after the exam is completed via the DOCTORAL QUALIFYING EXAMINATION. Upon successful completion of written and oral preliminary exams, initiate the form ADMISSION TO CANDIDACY FOR DOCTORAL DEGREE to the graduate program assistants in the main biology office. The student is now eligible to enroll in BSC 699 Dissertation Research.

Continuous Enrollment Policy

See here for the Graduate School Continuous Enrollment policy.

Dissertation Requirements

Ph.D. Advisory Committee: A student must form a Ph.D. Advisory Committee prior to their first semester review meeting. The first committee meeting is to be held after completion of the first semester of studies (by January 31st for students entering in the fall semester and by June 30th for students entering in the spring semester) to evaluate progress toward a degree. In subsequent years of study, the committee will meet prior to December 15th to review progress during the previous academic year. It will also meet as needed to administer all qualifying and final examinations, and to examine and approve the dissertation.

Ph.D. Dissertation Committee: Once a Ph.D. student has passed their preliminary examinations and been admitted to candidacy the advisory committee must include at least one member from outside the student's major department. This external member may be from another institution. This external Ph.D. Dissertation Committee member may replace an existing Ph.D. advisory committee member. However, the Ph.D. Dissertation Committee must consist of at least five members including the external member, all of whom are voting members regarding the candidate's progress toward degree.

Formal Departmental Dissertation Seminar and Oral Examination (defense): In addition to participation in the departmental research symposiums, a publicly announced final formal departmental dissertation seminar (or defense) of the student's research is required. The seminar is scheduled immediately preceding the final oral examination. All students are required to notify departmental office personnel of the date, time and room location of their formal dissertation a minimum of 14 days prior to the dissertation defense. A title and an abstract must be submitted to

the departmental office at the time of dissertation notification so that a public announcement can be made. In addition, a copy of the final draft of your dissertation must be made available in the departmental office for those wishing to review it.

Time Limits for Degree Completion Requirements

See additional information on time limits for degree completion.

Student Progress Requirement

Annual Progress Review: Each graduate student will meet annually prior to December 15th with his/her Ph.D. Advisory Committee for the purpose of reviewing the student's progress toward a degree during the previous academic year. First year students must meet with their committee after completing the first semester of studies (by January 31st for students entering in the fall semester and by June 30th for students entering in the spring semester). These evaluations are a part of the data used to establish priorities for assistantships. The student is expected to make a formal presentation to the committee during the annual meeting. This presentation shall include a description of progress made with respect to research and completion of other degree requirements. When the presentation has been completed, the student will be asked to leave the room and the committee shall then evaluate the student's progress. This evaluation will result in a "Pass", "Probationary pass", or "Fail". Guidelines for these rankings are given below:

- **Pass:** The graduate student is making satisfactory research progress commensurate with their time in the program, has maintained at least a 3.0 cumulative GPA, and has met other requirements of the program (e.g., formed a committee, presented a research proposal, etc.) in a timely manner.
- **Probationary Pass:** The graduate student has fallen behind schedule with respect to such requirements as formation of a committee, literature search and submission of a research proposal, scheduling and taking required examinations (for PhD students only), writing of the thesis or dissertation etc. (see degree timeline), or little or no research progress has been made since the last annual review. It may apply to a student receiving a grade lower than a B in a course during the previous year even though the (overall cumulative) GPA is 3.0 or higher. Committees awarding a Probationary Pass for students who have fallen behind schedule must provide a written rationale to the Graduate Committee and the Department Chair in the annual committee report, including clearly defined milestones or benchmarks the student must reach in order to bring their performance up to standard. The student must submit a remediation plan to their committee members addressing the concerns of the committee, including procedures for how milestones and benchmarks will be met, as well as a timeline, within two weeks of notification of their Probationary Pass. This plan must be signed by the major advisor and two other members of the student's advisory committee, and presented for approval to the Graduate Program Director. Once approved, the remediation plan document will be placed in the student's file, and a copy given to the student. Furthermore, the graduate student must have a follow-up committee meeting within six months of the annual review to evaluate their progress on the remediation plan. At the conclusion of the six-month follow-up meeting, the student will be awarded either a Pass or a Fail.
- **Fail:** The graduate student's progress is unacceptable for reasons such as a cumulative GPA of less than 3.0 in all (both graduate and undergraduate) courses attempted, insufficient research progress, or

not completing the degree within time limits without an acceptable/ approved reason.

Appeal of a dismissal decision. If a decision was made to dismiss the student from the program, the student may make a formal appeal. This should be done according to the University of Alabama's University-wide Academic Grievance Procedures, described in the faculty handbook and available online at <https://facultyhandbook.ua.edu/>.

Additional information on student progress.

Additional Academic Requirements

Research Expectations: All Ph.D. students are expected to make a meaningful contribution to their chosen research area. Prior to their dissertation defense, all students in the Ph.D. program **must** submit for publication to a peer-reviewed journal at least one first-author manuscript containing data produced by the student during enrollment in the Ph.D. program. Proof of submission (e.g. confirmation e-mail from journal editor) must be submitted to the Graduate Program Office.

All graduate students are required to register for and attend the weekly departmental seminar, enrolling in BSC 601 Biological Sciences Seminar each semester they are in residence at the Tuscaloosa campus.

Academic Misconduct Information

See information on academic misconduct.

Withdrawals and Leave of Absence Information

See information on withdrawals and leave of absence in the handbook.

Academic Grievances Information

See information on academic grievances.

Scholastic Requirements

See scholastic requirements in the handbook.

Graduate School Deadlines Information

See information on Graduate School deadlines.

Application for Graduation Information

See information on application for graduation.