Biology

- Doctor of Philosophy in Biology (p. 1)
- Master of Science, Biology (p. 2)

Karolyn Hansen, Department Chairperson
Amit Singh, Graduate Program Director

Please visit our department website (https://www.udayton.edu/artssciences/academics/biology).

The Department of Biology offers programs leading to the Master of Science and the Doctor of Philosophy. These are research focused degrees tailored to the student’s interests and career plans through conversations with the faculty mentor, supported by curriculum and weekly seminars. The specific program is determined after consultation between the student and the advisory committee. Two major areas of specialization are available: Environmental/Ecological Science and Biomedical Sciences. The Department of Biology also offers a Master of Science program without a thesis requirement.

Assistantships

Qualified applicants are eligible for financial assistance in the form of fellowships, traineeships, and research or teaching assistantships. Students admitted to the doctoral program are given priority for these awards. In addition to a stipend, all appointments with financial aid are exempt from tuition during both the academic year and the summer session. Financial aid is available during the summer on a competitive basis.

Advising

Each student is assigned a provisional advisor for assistance during the first semester. Prior to registration for the second semester each student selects a major professor, who will serve as director of the student’s advisory committee. The composition of this committee is representative of the general field of study in which the student expects to work. The committee helps to plan the student’s entire program. The committee generally meets with the student twice a year to offer suggestions and assess progress in the program and thesis research.

Doctor of Philosophy in Biology (BIO)

Each student is required to complete each course by the end of the first year:

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<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIO 552</td>
<td>Research Methods in Biomedical Science</td>
<td>4</td>
</tr>
<tr>
<td>&amp; BIO 553</td>
<td>and Research Methods in Ecology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 501</td>
<td>Seminar</td>
<td>0</td>
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<tr>
<td>BIO 601</td>
<td>Special Topics</td>
<td>1</td>
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<tr>
<td>Two advanced courses</td>
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<td>6</td>
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Following completion of the first year, each doctoral student follows the program outlined by the advisory committee. In practice, most students find it helpful to take at least 30 semester hours of graduate course credits beyond the bachelor’s degree in addition to 30 credit hours of dissertation research to attain the level of competence suitable for a doctoral candidate. All Ph.D. students who have not taken a biostatistics course as an undergraduate must enroll in BIO 550 Biometrics. Individuals on teaching assistantships must complete the teaching seminar BIO 503 College Teaching Seminar and teach at least one laboratory course during their tenure in the program.

Residence Requirement

A student is strongly advised to devote as much time as possible to graduate studies. To satisfy the residency requirement, Ph.D. students must attend the University as a full-time student. The Ph.D. program is a full-time only program. If the advisory committee encourages attendance of a semester or a summer as a full-time student at a neighboring institution or in an off-campus research site, that time may be applied to the residence requirement.

Sequence of Evaluation

The program is centered on the development of professional competence. Each student is formally assessed in the following steps:

1. A qualifying examination at the beginning of the second year of full-time graduate study for all graduate students.
2. A candidacy examination over the area of specialization (Ph.D. students only).

Each semester the graduate coordinating committee evaluates the overall performance of each student toward obtaining the degree. A student judged to be making unsatisfactory progress may be placed on probation or dismissed from the program. Further details concerning the policies of the graduate program can be found in the Manual for Graduate Studies in the Department of Biology at the University of Dayton.

Qualifying Examination

At the beginning of the second full year of graduate work, all Ph.D. students will take a qualifying examination. An important purpose of the examination is to aid the student’s advisory committee in planning the remainder of the program. The examination will cover basic biological concepts, subject matter of graduate courses taken, and broad areas of the student’s specialty. The emphasis will be not only on facts but on the student’s command of self-expression, ability to reason, and to integrate knowledge.

Utilizing the student’s performance in both the written and oral phases of the exam, the advisory committee makes an evaluation and suggests one of the following possible alternatives:

1. The student should continue to work toward completion of the Ph.D. degree.
2. The student should correct obvious deficiencies and retake the written and/or oral examination(s) - (retake must be scheduled no later than the middle of the next semester and result in a clear pass or fail/withdrawal from graduate work).
3. After consultation with the advisory committee, the student should switch to the M.S. program.
4. The student should withdraw from graduate work (student has failed the examination without an opportunity of a second chance).

All other graduate examinations come at specific times in the progress of the student’s program and are scheduled and administered by the advisor and advisory committee. These examinations consist of the Ph.D. candidacy examination, and the defense of the Ph.D. dissertation.

Ph.D. Candidacy Examination
The candidacy examination for Ph.D. students is administered by the advisory committee, which may be supplemented by members requested by the committee and/or the department chair. The examination will be taken no later than the end of the sixth semester for those entering the program with a B.S. or M.S. The purpose of the examination is to judge the student's competence in the special area and in related fields. Following the examination, the student may be directed to (a) complete the dissertation, (b) strengthen preparation by demonstrating competence in one or more areas, (c) withdraw from the Ph.D. program and complete a thesis M.S. degree, or (d) withdraw from the program. The committee's discretion, additional competence in an area may be demonstrated by special examination or by completion of specific courses to the committee's satisfaction. The student is considered a candidate for the Ph.D. after successful completion of these requirements.

Defense of Dissertation

1. The examination on the Ph.D. dissertation will consist of a formal oral examination on the subject matter of the dissertation.
2. A Ph.D. student must present the dissertation for defense within five years after admission to candidacy.

Master of Science in Biology (BIO)

The M.S. degree requires 24 semester hours of coursework plus a research thesis. Each student is required to complete each course by the end of the first year:

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All M.S. students who have not taken a biostatistics course as an undergraduate must enroll in BIO 550 Biometrics. Individuals on teaching assistantships must complete the teaching seminar BIO 503 College Teaching Seminar and teach at least one laboratory course during their tenure in the program. Students declaring the M.S. non-thesis option are required to complete 30 hours of coursework consisting of the aforementioned courses. A research paper is required, and the subject matter of the paper is determined by the advisory committee.

Combined B.S./M.S. Program

The B.S./M.S. in Biology is an accelerated, highly structured program designed for students who show an early interest in, and a strong potential for, research in the biological sciences. The combined program provides an undergraduate liberal arts education, a broad, basic background in the biological sciences, the development of expertise in a biological subfield, and thorough introduction to research instrumentation and techniques. Graduates from the program are prepared for either direct entry into the job market or for continuation toward the Ph.D. degree. The combined B.S./M.S. Program in Biology is open only to students pursuing a B.S. degree in Biology or Environmental Biology at the University of Dayton. Interested students should apply by October 15th of their Junior Year (or credit hour equivalent) of undergraduate education. Qualified students will have a minimum of a 3.5 science GPA (BCMP). The general GRE is required for admission to the program. Applicants are conditionally admitted to the program until completion of their B.S. degree, after which they will be officially admitted into the program. Students will be expected to begin Honors undergraduate thesis research in the summer prior to their 4th year of undergraduate education. The undergraduate B.S. degree in Biology or Environmental Biology will be awarded at the completion of the 4th year. The fifth year is devoted to graduate coursework and thesis research. Students are expected to maintain a graduate GPA of 3.5. Students will be expected to conduct research during the summer between the 3rd and 4th, 4th and 5th year, and the summer after their 5th year with defense of the M.S. thesis anticipated for August of that summer. The master's degree in Biology is awarded upon the successful defense of the M.S. thesis. No tuition waivers or financial support exists for the 5th year of this program, though summer research fellowship support is available on a competitive basis. Applications can be submitted through the online UD Graduate School application site: [https://www.udayton.edu/academics/graduate/index.php](https://www.udayton.edu/academics/graduate/index.php). Please indicate the B.S./M.S. option on your application.

Residence Requirement

A student is strongly advised to devote as much time as possible to graduate studies. To satisfy the residency requirement, M.S. students must attend the University as a full-time student for at least one full year. If the advisory committee encourages attendance of a semester or a summer as a full-time student at a neighboring institution or in an off-campus research site, that time may be applied to the residence requirement.

Sequence of Evaluation

The program is centered on development of professional competence. Each student is formally assessed in the following steps:

1. A qualifying examination at the beginning of the second year of full-time graduate study for all graduate students.

Each semester the graduate coordinating committee evaluates the overall performance of each student toward obtaining the degree. A student judged to be making unsatisfactory progress may be placed on probation or dismissed from the program. Further details concerning the policies of the graduate program can be found in the Manual for Graduate Studies in the Department of Biology at the University of Dayton.

Qualifying Examination

At the beginning of the second full year of graduate work, all M.S. students will take a qualifying examination. An important purpose of the examination is to aid the student’s committee in planning the remainder of the program. The examination will cover basic biological concepts, subject matter of graduate courses taken, and broad areas of the student’s specialty. The emphasis will be not only on facts but on the student’s command of self-expression, ability to reason, and to integrate knowledge.

Utilizing the student’s performance in both the written and oral phases of the exam, the advisory committee makes an evaluation and suggests one of the following possible alternatives:

1. The student should continue to work toward completion of the M.S. degree.
2. The student should correct obvious deficiencies and retake the written and/or oral examination(s) - (retake must be scheduled no
later than the middle of the next semester and result in a clear pass or fail/withdrawal from graduate work).

3. The student should withdraw from graduate work (student has failed the examination without an opportunity of a second chance).

4. M.S. students who show outstanding ability and wish to proceed toward the Ph.D. may be encouraged to stay at UD. They are required to pass the qualifying exam, present and defend an oral research progress report, and Ph.D. proposal to their advisory committee in their third semester of the program. The advisory committee will decide if the student shows sufficient ability to enter the Ph.D. program. Upon positive recommendation from the advisory committee, the student must submit a formal application for admission to the Ph.D. program to the Admissions Committee by the third week of their fourth semester of the program. The Admissions Committee will make the final recommendation regarding their acceptance. If accepted, the student must conform to all requirements of the Ph.D. program.

5. At the time of the qualifying exam, both the student and advisory committee have the final opportunity to review the choice of the M.S. program - thesis or non-thesis option. For the non-thesis option, the nature of the requirements should be specified by the advisory committee. If under unusual circumstances, a student wishes to change options after this date and the advisory committee concurs, it should be recognized that this may result in an additional semester or more of work. However, consideration should be given to the availability of support for continuation of a M.S. program beyond two years.

Students who choose to complete a Master’s degree are considered candidates for that degree after the qualifying examination. A student who wishes to continue beyond the Master’s degree will be advised to continue for the doctorate (see requirements above) or to terminate his/her studies at the university on the basis of his/her performance in earning the Master’s degree.

All other graduate examinations come at specific times in the progress of the student’s program and are scheduled and administered by the advisor and advisory committee. These examinations consist of the defense of M.S. thesis and the final M.S. non-thesis program exam.

**Defense of Thesis**

1. The examination on the M.S. thesis will consist of a formal oral examination on the subject matter of the thesis.
2. For students electing the non-thesis option, an oral examination is held over the subject matter of the research paper.
3. All those working toward the master’s degree must complete the program within five years after admission to the program.

**Courses**

**BIO 501. Seminar. 0 Hours**

Presentation of biological research data by faculty members and visiting scientists. Required of all graduate students each semester.

**BIO 503. College Teaching Seminar. 1 Hour**

To assist graduate teaching assistants in acquiring information, understanding, and skills seen as important components of effective teaching.

**BIO 509. Ecological Restoration. 3 Hours**

Principles and practices of ecological restoration. The course presents the rationale and knowledge needed to understand, appreciate, plan and perform ecological restoration. Prerequisite(s): Graduate status.

**BIO 511. Ecosystem Dynamics. 3 Hours**

An advanced course examining ecosystem structure and function. Emphasis on community level interactions, applied ecology and the ways in which ecosystem biodiversity can be influenced by the biotic and abiotic forces of the environment, including the global impact of the human species.

**BIO 512. Genetics of Human Disease. 3 Hours**

Study of the molecular genetics of inherited human diseases using a systems-approach. This course is a survey of inherited diseases linked to major organs and organ systems. Prerequisite(s): Graduate student status.

**BIO 521. General Microbiology. 3 Hours**

A graduate level introduction to general microbiology covering fundamental topics, such as structures and functions, genetics, physiology, and metabolism. This course includes weekly journal club discussions to immerse students in current microbiology research. Students are also responsible for providing one guest lecture in the BIO 411 General Microbiology class to demonstrate their learning. Prerequisite(s): Graduate level or instructor’s approval.

**BIO 522. Immunology. 3 Hours**

Study of innate and acquired immunity, cells and organs of the immune system, antigens and immunoglobulins. Specific emphasis on the organization and expression of immunoglobulin genes; genetic restriction; cytokines and immune regulation including hypersensitivity, immune tolerance, transplantation and autoimmunity. Biochemistry recommended.

**BIO 535. Problems in Field Biology. 1-3 Hours**

Course designed to acquaint students with field-oriented problems in biology.

**BIO 545. Evolution & Development. 3 Hours**

Molecular and population genetic examination of the evolution of animal form. Topics include comparative developmental biology, population genetics, and molecular evolution. Prerequisite(s): Student status in Biology or permission of instructor.

**BIO 550. Biometrics. 3 Hours**

Design and analysis of experiments in quantitative biology. Parametric and nonparametric analyses of both laboratory and field-generated data sets.

**BIO 551. Laboratory Skills in the Biological Sciences. 2 Hours**

Laboratory Skills in the Biological Sciences (Bio 552-P3), taught in the Department of Biology, is tailored to introduce our graduate students to this fast changing field of research by teaching shared methodologies and techniques involved in biology.

**BIO 552. Research Methods in Biomedical Science. 4 Hours**

Theory and applications of protein and nucleic acid techniques designed to acquaint students with advanced laboratory techniques used in biological research.

**BIO 553. Research Methods in Ecology. 4 Hours**

Advanced research techniques and instrumentation in Ecology and Field Biology. Prerequisite(s): Graduate Student Standing.
BIO 554. Scientific Practice. 2 Hours
Students are prepared for practicing aspects of a scientific profession. Scientific ethics, grant and manuscript writing, internal regulatory boards, and intellectual properties are covered. This course also covers topics in the responsible conduct of research drawing from case studies from the Association of American Medical Colleges and the NIH. Students will review case studies in preparation for class discussion. Graduate Student Standing.

BIO 555. Laboratory Techniques (Topic). 1-3 Hours
Advanced treatment of new techniques and instrumentation used in specialized areas of biology. Changes with advances in a specialty are reflected in the course title.

BIO 566. Biology of Infectious Disease. 3 Hours
The nature of infectious diseases, host-parasite relationships in resistance and infection, defense mechanism (antigen-antibody response); survey of the bacteria causing disease in humans; in-depth discussion of current infectious disease research.

BIO 594. Molecular Biology - Theory & Practice. 3 Hours
Introduction to the theory and practice of molecular biology techniques. Topics and laboratory exercises include the enzymatic manipulation of DNA and RNA, Southern and Northern blotting, library screening, DNA sequencing, DNA amplification, and gene promoter structure and function.

BIO 596. Current Biology Problems. 1-3 Hours
Consideration of recent developments in biological thought and procedure. Prerequisite(s): Permission of department chairperson.

BIO 599. Thesis. 1-6 Hours
Research for the master's degree.

BIO 601. Special Topics. 1 Hour
Development, presentation, and discussion of topics in specialized areas of biology. Required of graduate students each semester.

BIO 699. Dissertation. 1-6 Hours
Research for the doctoral degree.