The Department of Biological Sciences

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Wayne L. Hynes, Chair
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Robert E. Ratzlaff, Biomedical Sciences Ph.D. Graduate Program Director

The Department of Biological Sciences provides a broad selection of course offerings. The degree program in biology allows for the selection of elective subjects most suited to the individual’s vocational interests.

Master of Science—Biology

Robert E. Ratzlaff, Graduate Program Director

The Department of Biological Sciences provides a broad selection of course offerings. The degree program in biology allows for the selection of elective subjects most suited to the individual’s vocational interests.

The curriculum for the Master of Science program is developed around one’s interests such as:

- botany,
- ecology,
- immunology,
- infectious diseases,
- marine biology,
- microbiology,
- physiology,
- reproductive biology,
- systematic biology, and
- zoology.

In addition, there are two specially designed concentration areas in:

- biotechnology and
- wetland ecology.

Facilities in the Department of Biological Sciences include:

- electron microscopy,
- terrestrial and aquatic animal care facilities,
- biomechanics,
- environmental pollution,
- marine benthic ecology,
- biotechnology,
- spectroscopy,
- cell culture,
- protein separation,
- DNA sequencing,
- GIS (Geographic Information System),
- digital imaging,
- a greenhouse,
- herbarium,
- zoological museum,
- animal facilities, and
- field science wet laboratories.

In addition, excellent opportunities exist for research and instruction off-campus at field research sites including:

- Blackwater Ecological Preserve,
- Virginia Coast Reserve-Long Term Ecological Research Site,
- Virginia Institute of Marine Sciences Eastern Shore Marine Laboratory, and
- other regional agencies and facilities.

Admission Information

Students who wish to enter this program should apply to the Master of Science in biology program and indicate their proposed field of study in the Statement of Interest, a required component of the application. Applications for admission can be obtained via the Internet at http://www.odu.edu/admission/graduate or from:

Office of Graduate Admissions
Old Dominion University
Norfolk, VA 23529-0050
(757) 683-3685

Requirements for regular admission to the master’s program in biology are:

1. a bachelor’s degree in biology or a related field from an accredited college or university;
2. a grade point average of at least 3.00 on a 4.00 scale;
3. Satisfactory scores on the General portion of the Graduate Record Examination (Verbal+Quantitative 1000 or 300 on the new GRE) or at least a 24 on the Medical College Admission Test
4. two letters of recommendation;
5. an essay describing the area of biology of interest for graduate study, professional goals and motivation for graduate study in biology; and
6. written acknowledgment from a Department of Biological Sciences faculty member agreeing to serve as the student’s major advisor, if the student is accepted.

The Test of English as a Foreign Language (TOEFL) is required of all applicants whose native language is not English: minimum scores are 550 for the paper-based test, 213 for the computer-based or 79 on internet-based test.

Deadlines for application to the program are:

- February 1 for summer admission, early fall admission and
- October 1 for spring semester admission.

Degree Requirements

Two degree options are available — thesis and non-thesis. A minimum of 31 semester hours of graduate credit is required of thesis students and 37 of non-thesis students; three-fifths of these credits must be at the 600-level or above. Research (BIOL 698) is required of all students. All students must deliver a scientific presentation in an appropriate public forum. For thesis students, the presentation should be at a scientific meeting. Course work, including any required courses, is selected according to the interest of the student, with the guidance and approval of the student’s faculty advisory committee. All students will complete a comprehensive exam (written or oral) that covers the student’s program of study. A substantial research project and a defense of the written thesis (BIOL 699) are required of students selecting the thesis option.

Master of Science - Biology

Many pertinent graduate courses are offered for the Master of Science in Biology programs that can be applied toward the degree requirements. A program of study is developed by the student with approval of advisory committee and the Graduate Program Director.

Master of Science - Wetland Biology Concentration

The wetland biology concentration has been structured to contain essential clusters in the following disciplines: plant identification, wetland and aquatic
ecology, soils and hydrology, regulation, technical application, topical seminars, internships, and research and/or thesis. Recommended course are:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOL 519</td>
<td>Wetland Plants</td>
<td>5</td>
</tr>
<tr>
<td>BIOL 550</td>
<td>Principles of Plant Ecology</td>
<td>4</td>
</tr>
<tr>
<td>OEAS 508</td>
<td>Introductory Soils</td>
<td>4</td>
</tr>
<tr>
<td>OEAS 622</td>
<td>Wetland Hydrology</td>
<td>3</td>
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**Master of Science - Biotechnology Concentration**

The biotechnology program is designed to enable the student to learn basic skills in cell and molecular biology, with the flexibility to develop a curriculum in the areas of infectious diseases, immunology, physiology, or environmental molecular biology.

Biotechnology students are required to take five core courses (below) in addition to the research and presentation requirements.

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOL 523</td>
<td>Cellular and Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 541</td>
<td>Biochemistry Lecture</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 543</td>
<td>Intermediate Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 671</td>
<td>Molecular and Immunological Techniques</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 755</td>
<td>Molecular Genetics</td>
<td>3</td>
</tr>
</tbody>
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The remaining coursework is selected according to the interest of the student, with the guidance and approval of the student’s faculty advisory committee.

**Doctor of Philosophy - Biomedical Sciences**

Robert E. Ratzlaff, Graduate Program Director

In this interdisciplinary program all students are required to master a broad knowledge of the basic biomedical sciences. Refer to the College of Sciences (http://catalog.odu.edu/graduate/collegesofsciences) section of this catalog for details.

**Doctor of Philosophy - Ecological Sciences**

Dr. Holly Gaff, Graduate Program Director

**Program Description**

The primary goal of the doctoral program in ecological sciences is to provide advanced training in ecological, evolutionary and integrative biology.

The program has notable strengths in a broad range of biological sub-disciplines, including:

- ecosystem studies,
- experimental ecology,
- community ecology,
- behavioral ecology,
- marine biology,
- molecular genetics,
- conservation biology,
- systematics,
- modeling,
- evolutionary biology,
- biomechanics,
- parasitology, and
- functional morphology.

Program faculty conduct studies in a variety of terrestrial, freshwater, and marine environments on several continents, and their research focuses on a broad spectrum of taxa, including, but not limited to:

- vascular plants,
- polychaetes,
- mollusks,
- crustaceans,
- insects,
- arachnids,
- birds,
- fishes, and
- amphibians.

Many faculty combine active field research with parallel laboratory studies. Quantitative approaches are encouraged and the opportunity exists to obtain a master’s degree in statistics while pursuing a doctorate in ecological sciences. The program is enhanced by excellent on-campus resources that include a scanning electron microscopy lab, genetic sequencing facilities, herbarium, aquatics laboratory, water tunnel and flow quantification facility, GIS facilities, greenhouse, and digital imaging facilities. Field research sites have been established in:

- the Virginia Coastal Reserve,
- Blackwater Ecologic Preserve,
- Great Dismal Swamp,
- Atlantic Ocean,
- Chesapeake Bay, and
- other areas.

**Admission**

Application forms for admission to the Ph.D. program in ecological sciences are available from the Office of Admissions and online (http://www.odu.edu/admission/graduate). The following should be sent to the Admissions Office:

1. the completed application form;
2. official transcripts from all universities attended;
3. Graduate Record Examination (GRE) scores;
4. test of English as a Foreign Language (TOEFL) score (from students whose native language is not English);
5. three letters of recommendation, including one from the applicant’s major advisor; and,
6. a statement of professional goals that includes specific research interests.

If an applicant is interested in requesting financial aid, an application for institutional graduate financial assistance should be completed during the application process (see Office of Admissions web page for form). The deadline for application to the program is February 1 for the subsequent fall semester. Students may be admitted during the spring and summer semesters as well, provided they obtain permission from the Graduate Program Director.

To qualify for admission, a student needs:

1. a satisfactory academic average (overall GPA score of at least 3.0 on a 4.0 scale, and overall GPA in the sciences of at least 3.0); and
2. GRE scores near the 70th percentile on each of the examination sections (verbal, quantitative, and analytical) with a combined total of at least 1,000 to 1,200 preferred on the verbal and quantitative sections;
3. a TOEFL score of at least 550 (paper-based test), 213 (computer-based test), or 79 (internet-based test) for applicants whose native language is not English;
4. satisfactory letters of recommendation; and
5. a statement of professional goals as stated above.

A master’s degree is desirable but not required. The applicant is expected to have a background in the sciences, with an appropriate undergraduate degree and substantial course work in biology, chemistry or geology.

Applicants are strongly advised to contact the ODU faculty member closest to their area of interest prior to submitting an application to determine whether that faculty member is accepting new graduate students. No student, regardless of qualifications, is admitted to the Ecological Sciences Program without the approval of a specific faculty advisor. Potential applicants therefore should initiate a dialogue, preferably by email, with an appropriate member of the program faculty. Applicants should consult the list of faculty in the Department of Biological Sciences, which includes a brief description...
of their research interests. Applicants may also find it desirable to visit the campus for an interview with a potential advisor and the Graduate Program Director.

It is important for potential applicants to realize that many considerations enter into the decision to accept a student into the program. In addition to the strength of an applicant’s credentials (GRE scores, transcripts, and letters of recommendation), the availability of space in the appropriate faculty advisor’s lab and availability of adequate financial aid may influence the decision. Of these, space in an appropriate advisor’s lab is the most important consideration after an applicant’s academic qualifications. For this reason, applicants are strongly encouraged to contact a potential advisor directly.

**Program Requirements**

Program requirements are designed to provide a firm foundation in conceptual elements of ecological, evolutionary, and integrative biology, while moving students expeditiously toward their own research. In general, students must complete:

- 48 hours beyond the master’s degree, or
- in the absence of a master’s, 78 hours beyond the bachelor’s degree.

The student’s program of study should be broad and balanced. Coursework varies with each student, depending on background and goals. Enrollment in a weekly ecology seminar is required, on average, one semester each year. Professional experience (environmental management or teaching) is encouraged. A five-member advisory committee of faculty is selected to guide the student through his or her course of study and to provide initial approval of the dissertation research. This committee also administers the comprehensive written and oral candidacy examinations, which are taken after all required coursework is completed and the research skill requirement (proficiency in one foreign language, computer programming, or a quantitative skill approved by the advisory committee) is satisfied. The written exam must be passed before the oral exam may be taken. Once the candidacy exams are completed and a dissertation committee approves a written dissertation prospectus, the student advances to candidacy. At least three of the members of the original advisory committee, including the committee chair (student’s major advisor), will compose the dissertation committee. This committee approves a written dissertation prospectus and will supervise the research. At this time, the student’s attention turns almost exclusively to his or her own research. However, students continue to participate in seminar courses on a variety of topics, and an average of one seminar course per year of residency on campus is required. At the conclusion of their research, the student submits a dissertation to the committee and presents a public defense of this work.