Overview - Interdisciplinary Graduate Programs

The Graduate School supports excellence and diversity in graduate education and scholarship. As a part of that support, the Graduate School houses the University's graduate interdisciplinary programs, the Ph.D. in Biomedical Sciences program, the M.S. in Cyber Security program, and the Graduate Certificate in Conservation Leadership. By managing these interdisciplinary programs centrally, the Graduate School will be able to coordinate efforts across departments and colleges.

Doctor of Philosophy - Biomedical Sciences

Lesley Greene, Graduate Program Director

In this interdisciplinary program all students are required to master a broad knowledge of the basic biomedical sciences. Integration of the basic courses is reinforced by a rotation of laboratory experiences and by special seminars that highlight disciplinary interrelationships and approaches to biomedical research. The student progresses from a core of basic courses to in-depth study of specific biomedical problems. This includes advanced doctoral courses and the doctoral research project. Under the guidance of the graduate faculty, the student will integrate knowledge from the broad spectrum of biomedical disciplines into his or her focus on an area of specialization.

The program graduate will be a scientist with a broad biomedical education and a demonstrated ability to carry out original and creative research, cognizant of the disciplinary interfaces and implications and capable of pursuing and/or recommending continuing lines of study. He/she will be prepared to bridge the gap between practice and discovery in the art of medicine and the practice of science. The graduate is capable of serving in an industrial, governmental, or academic teaching or research setting, either independently or as a member of a team.

Admission

The requirements for admission to the biomedical sciences Ph.D. program are as follows:

1. A bachelor’s degree from an accredited college or university with a B (3.00) average. Students with advanced degrees are encouraged to apply.
2. GRE scores: 300 combined verbal and quantitative, and at least a 3.5 on the analytical writing section.
3. GRE scores (older version): 1000 combined verbal and quantitative.
4. Prior training in biology (two years), calculus and/or statistics, and organic chemistry (one year). Additional courses in biology, chemistry, and physics are recommended.

Curriculum and Requirements

To accomplish the objectives of the program, the student:

1. Enrolls in the basic biomedical sciences courses to develop a broad foundation for more advanced course work and dissertation research;
2. Selects appropriate advanced course work approved by the guidance committee;
3. Completes at least 79 credit hours beyond the bachelor’s degree or 48 credit hours beyond the master’s degree;
4. Presents two seminars;
5. Passes either
   a. written and oral qualifying examinations on course work or
   b. an NIH-style grant proposal written on a research question in an area not specific to the planned research in the mentor’s laboratory and an oral exam on the grant proposal and on coursework;
6. Develops an interdisciplinary research proposal in NSF or NIH format that is accepted by the guidance committee;
7. Performs publishable research to demonstrate the ability to complete original and creative research projects; and
8. Prepares and successfully defends a dissertation.

Application Procedures

The completed application for the biomedical sciences Ph.D. program will include the following items:

1. Transcripts of all college course work. Transcripts will be official transcripts sent by the registrars of the colleges attended.
2. Graduate Record Examination (GRE) test scores, sent directly from the Educational Testing Service to the Old Dominion University Graduate Admissions Office. The Medical College Admissions Test (MCAT) can substitute for the GRE (minimum score 26).
3. A statement of personal goals and academic objectives.
4. Three letters of recommendation, preferably from faculty members at colleges attended who are familiar with the applicant’s academic and research capabilities.
5. A completed application form.
6. Receipt of the application fee. Checks should be made payable to Old Dominion University.
7. Test of English as a Foreign Language (TOEFL) test scores, sent directly from the ETS to ODU International Graduate Admission Office must accompany international applications for applicants with a degree issued outside of the United States.

Applications to Old Dominion University can be completed on-line at http://www.odu.edu/admission/graduate.

The applicant is responsible to ensure that all application materials are received and the application is complete in all respects.

Financial Aid

Sources of financial aid available to biomedical sciences Ph.D. students include

1. waivers of tuition,
2. research and teaching assistantships and
3. loans.

Master of Science in Cybersecurity

Hongyi Michael Wu, Graduate Program Director

The Master of Science in Cybersecurity is a 30-credit hour non-thesis degree program. It is designed to prepare cyber security technology leaders.

Graduates will develop skills and competencies in technical aspects of cybersecurity and will be prepared to assume responsibility for the management of cybersecurity projects and coordination of cyber operation teams. It also provides preparation for students desiring to pursue doctoral studies or teach cybersecurity courses in 2- and 4-year colleges and universities.

The program is offered in online format and with the option for local students to attend classes on campus. The required core courses focus on the fundamental knowledge of cybersecurity, covering advanced cybersecurity principles, techniques, and operations, as well as advanced topics in law, policy, management and leadership in cybersecurity. Students will have opportunities to choose five restricted electives to learn about different aspects of cybersecurity. The capstone course provides opportunities to synthesize and apply the knowledge and skills to solve real-world cybersecurity problems.
Admission
The requirements for admission to the Master of Science in Cybersecurity program are as follows:

1. A bachelor’s degree from an accredited college or university in the U.S. or an equivalent foreign institution.
2. GRE scores with a 50% or better attainment on quantitative reasoning.
3. Current scores on the Test of English as a Foreign Language (TOEFL) of at least 550 from applicants whose native language is not English (waived if applicant has earned a college degree from an accredited institution in an English-speaking country.)

Students with previously completed work at a regionally-accredited institution may submit a request for a maximum of 12 elective graduate credit hours to be transferred into the program. If approved by the admission committee, it will be added to the transcript.

Curriculum and Requirements
This program consists of four core courses (12 credit hours), five electives (15 credit hours), and one capstone course (3 credit hours). The four core courses focus on the fundamental knowledge of cybersecurity, covering advanced cybersecurity principles, techniques, and operations, as well as advanced topics in law, policy, management and leadership in cybersecurity.

The five electives provide students with opportunities to learn about different aspects of cybersecurity, e.g., in information systems, network systems, mobile and wireless systems, operating systems, and cyber-physical systems. Courses are also offered to address such important cybersecurity topics as reverse software engineering, digital forensics, thread modeling, and ethical hacking and penetration testing.

The capstone course brings together students in their final semester of study to synthesize knowledge from their previous coursework and apply it to solve real-world cybersecurity problems. The faculty member who teaches the capstone course will work with industrial and academic partners who will serve as external mentors of the capstone course. Each student in the capstone course will discuss—with both faculty member and mentor—development of her/his master’s project that aims to solve a cybersecurity problem in a real-world business setting.

Core Courses
- CYSE 600 Cybersecurity Principles 3
- CYSE 601 Advanced Cybersecurity Techniques and Operations 3
- CYSE 603 Advanced Cybersecurity Law and Policy 3
- CYSE 605 Leadership and Management in Cybersecurity 3

Restricted Elective Courses
- CS 564 Networked Systems Security
- CS 565 Information Assurance
- CS 595 Topics in Computer Science
- CYSE 607 Advanced Digital Forensics
- CYSE 615 Mobile and Wireless Security
- CYSE 615 Mobile and Wireless Security
- CYSE 625 Advanced Ethical Hacking and Penetration Testing
- CYSE 697 Independent Study in Cybersecurity
- ECE 516 Cyber Defense Fundamentals
- ECE 519 Cyber Physical System Security
- IT 624 Information Technology Assurance Services
- IT 664 Project Management in Information Technology
- IT 685 Introduction to Information Security
- MSIM 670 Cyber Systems Engineering
- MSIM 673 Threat Modeling and Risk Analysis
- MSIM 773 Networked System Security

Capstone Course
- CYSE 698 Master’s Project 3

Total Hours 30

Recommended Plan of Study for Full-Time Students

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<th>First Year</th>
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Total credit hours: 30

Recommended Plan of Study for Part-Time Students

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Second Year

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Third Year

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</table>
The applicant is responsible to ensure that all application materials are received and the application is complete in all respects.

**Financial Aid**

Sources of financial aid available to biomedical sciences Ph.D. students include

1. waivers of tuition,
2. research and teaching assistantships and
3. loans.

**Graduate Certificate in Conservation Leadership**

Tatyana Lobova, Certificate Coordinator

This interdisciplinary certificate in Conservation Leadership was developed, and is implement by Old Dominion University, in collaboration with the U.S. Fish and Wildlife Service (USFWS) as a part of a long-term, sustainable program of conservation-related service-learning, internships, and leadership programs. The certificate will facilitate the development of the next generation of professionals who can address the challenges for conservation posed by a changing climate and sea level rise.

**Degree Requirements**

The certificate requires four core courses (3 credit hours each) and one elective (3 credit hours). One of the core courses is a mentored internship, preferably at a USFWS or related facility. A unique aspect of this certificate is the requirement to take one course (3 credit hours) that is designated as a service-learning course in which the student will be engaged in a project at a USFWS (or related) facility.

**Required Courses**

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<td>BIOL/OEAS 567</td>
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<td>OEAS 658</td>
<td>Participatory and Agent-Based Modeling, Simulation, and Visualization</td>
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<td>CPS 669</td>
<td>Internship in Conservation Leadership</td>
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Total Hours 12

**Electives**

Select one of the following:

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<td>POLS 555</td>
<td>The Politics of Climate Change</td>
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Total Hours 3 - 5

Total Hours 15-17