BIOLOGICAL SCIENCES, PH.D.

Credits: 72
CIP Code: 260101

Program Overview

The **Doctor of Philosophy (Ph.D.) Degree Program in Biological Sciences** trains and develops scholars and promotes research by providing students with contemporary concepts in the fields of cellular biology, molecular biology, and biochemistry. Each student receives thorough intellectual training in a particular specialty and must master the methods that are requisite for productive scholarly endeavors in that specialty. Graduate students are primarily engaged in research, but also take courses in specialized areas of interest, participate in seminars, and have opportunities to gain teaching experience while satisfying other requirements of their doctoral programs. Students carry out their research in state-of-the-art laboratories supervised by the faculty. Some of the research faculty members participate in and are supported by federally funded research programs. The Department fosters and maintains collaborations at local, national academic, industrial, and governmental research facilities. These collaborations provide opportunities for doctoral students to expand their research specialty areas.

Admissions Requirements

Applicants to the **Doctor of Philosophy Degree in Biological Sciences** must meet the General Admissions Requirements as published in this Catalog. GRE Required.

Program Objectives

1. Emphasize the multidisciplinary aspects of modern biological sciences.
2. Promote the development of the skills required for scientific inquiry, writing and presentation.
3. Provide opportunities for students to gain academic teaching and research experiences that will prepare them for scholarly and productive endeavors.
4. Train scientists and scholars to perceive fundamental biological problems and to investigate them successfully.
5. Prepare Ph.D. level students for postdoctoral research or academic teaching positions in academic institutions and biotechnology or other industries.

Student Learning Outcomes

Students pursing the **Doctor of Philosophy Degree in Biological Sciences** will:

1. Conduct independent and collaborative research to prepare proposals for fellowship and funding, and scientific articles in peer-reviewed journals.
2. Communicate effectively biological information in written and oral formats to scientific and nonscientific audiences at professional conferences, workshops, seminars, and other academic venues.
3. Teach laboratory classes in introductory biology.
4. Practice professional ethical standards in the conduct of scientific experiment, inquiry, scholarly research and teaching.

Degree Requirements

In addition to the General Degree Requirements as published in this Catalog, candidates for the **Doctor of Philosophy Degree in Biological Sciences** must complete a minimum of seventy-two (72) graduate credits in residence. Each student must pass a qualifying examination for admission to candidacy and defend a dissertation of original research conducted under the supervision of his/her major advisor and Dissertation Committee. As part of a comprehensive training program, each candidate for the **Doctor of Philosophy Degree in Biological Sciences** is required to serve as a Teaching Assistant in an undergraduate laboratory course for at least three (3) semesters under the supervision of a faculty member of record for the course.

Code	Title	Hours
Core Courses		
CBIO 501	Biology Seminar [1]	0
CBIO 502	Instructional Practicum [2]	0
CBIO 504	Molecular Genetics	3
CBIO 506	Cell Biology	3
CBIO 509	Methods & Techniques in Bio.	3
CBIO 511	Biochemistry I	3
CBIO 512	Biochemistry II	3
CBIO 551	Biostatistics	3
Laboratory Rotation Requirements		
During the first year of study, all students pursuing the Doctor of Philosophy Degree in Biological Sciences are required to complete at least three (3) laboratory rotations (10 hours per week each). Laboratory rotations provide doctoral students with exposure to a variety of research projects and techniques conducted in faculty research training laboratories. The rotations will also give students opportunities to make a decision regarding the research laboratory in which they will conduct their dissertation research.		
Advanced Courses in the Area of Specialization		
Select two of the following:		6
CBIO 633	Advances in Molecular Biology	
CBIO 635	Advances in Cellular Biology	
CBIO 643		
Additional advanced courses will be required depending on students' research concentrations.		
Research Courses in Biology: Variable Credits		
CBIO 683	[3]	1
CBIO 884	Research In Biochemistry	3-12
CBIO 871	RSCH in Molecular Biology	3-12
CBIO 881	RSCH in Cellular Biology	3-12
CBIO 901		1
Total Hours		**35-62**

1. All Ph.D. graduate students must enroll and attend CBIO 501 Biology Seminar until matriculation.
2. All Ph.D. students are required to register this course to document three (3) semesters of teaching activity.
3. This course is required for the 4th or 5th Ph.D. candidate to present his/her thesis research in front of the audiences prior to thesis defense.

Research Tools

Students must demonstrate proficiency in contemporary research methodologies, tools and technologies such as, Bioinformatics (CBIO 556 Bioinformatics) as designated by the Department of Biological Sciences.

Qualifying Examinations

The Qualifying Examination is scheduled and conducted by the student's dissertation committee. The PhD degree Program Qualifying Form and Research Prospectus must be filed in the departmental office at least one semester prior to the Qualifying Examination, which in turn must be taken at least two academic years prior to the time the degree is to be conferred but not earlier than the completion of two years of graduate work. Students are permitted two (2) attempts to successfully complete the Qualifying Examination.

Dissertation

The terms thesis and dissertation are sometimes used interchangeably. However, more commonly, the term thesis is used in conjunction with the work submitted in partial fulfillment of the requirements for the MS degree and dissertation refers to the treatise or discourse submitted for the PhD degree. The thesis or dissertation is a formal presentation of the student's original investigations. It should demonstrate the candidate's technical competence and potential for carrying out productive research. It must contribute something additional to the existing body of knowledge or bring into focus a significantly different critical interpretation of the existing knowledge. It is the most important proof of a candidate's scholarly potential. It also reflects the competence and standards of the departmental faculty and the University. Therefore, it must truly be a scholarly production.

Final Examination

These are formal departmental requirements and as such must be scheduled during regular academic year or summer session. The following procedures are to be followed to complete these requirements:

1. The PhD candidate should hold a formal meeting with his/her research committee to present a concise overview of finalized research data.
2. Upon approval by the committee, a final signed draft of the dissertation should be submitted to the department chair.
3. A research seminar/oral defense is required. The candidate or the advisor should schedule the seminar/oral defense based on the Office of Graduate Studies thesis submission timeline.
4. The seminar/oral defense is scheduled as a formally announced departmental event. Biology faculty and graduate students are invited to attend and actively participate in the same as a scientific/intellectual interaction between the candidate and the attendees. The seminar/oral defense is to be professionally prepared with appropriate visual aids.
5. Announcement must be posted one week prior to the seminar/oral defense. The Department of Biological Sciences considers the opinion of the total faculty in attendance in arriving at a consensus on the scientific/professional caliber of the seminar. Serious concerns indicated by a consensus of the attending faculty may result in the candidate having to repeat this departmental requirement.
6. At the conclusion of the seminar/oral defense, the research advisor should ensure that the Seminar and Oral Presentation Approval Forms are completed and signed by all faculty members in attendance including the Department Chair.

Biological Sciences, Ph.D.

Course	Title	Hours
First Year		
First Semester		
CBIO 501	Biology Seminar [1]	0
CBIO 502	Instructional Practicum [2]	0
CBIO 504	Molecular Genetics	3
CBIO 509	Methods & Techniques in Bio.	3
CBIO 511	Biochemistry I	3
Laboratory Rotation I		
Laboratory Rotation II		
	Hours	**9**
Second Semester		
CBIO 501	Biology Seminar [1]	0
CBIO 502	Instructional Practicum [2]	0
CBIO 506	Cell Biology	3
CBIO 551	Biostatistics	3
CBIO 512	Biochemistry II	3
Laboratory Rotation II (continued)		
Laboratory Rotation III		
	Hours	**9**
Third Semester		
CBIO XXX	Research in Biology	3
	Hours	**3**
Second Year		
First Semester		
CBIO 501	Biology Seminar [1]	0
CBIO 502	Instructional Practicum [2]	0
CBIO 635	Advances in Cellular Biology	3
CBIO XXX	Research in Biology	6
	Hours	**9**
Second Semester		
CBIO 502	Instructional Practicum [2]	0
CBIO 633	Advances in Molecular Biology	3
CBIO XXX	Research in Biology	6
	Hours	**9**
Third Semester		
CBIO XXX	Research in Biology	3
	Hours	**3**
Third Year		
First Semester		
CBIO 501	Biology Seminar [1]	0
CBIO XXX	Research in Biology	6
	Hours	**6**
Second Semester		
CBIO 501	Biology Seminar [1]	0
CBIO XXX	Research in Biology	6
	Hours	**6**
Third Semester		
CBIO XXX	Research in Biology	3
	Hours	**3**

Fourth Year		
First Semester		
CBIO 501	Biology Seminar [1]	0
CBIO 683	[3]	1
CBIO XXX	Research in Biology	6
	Hours	**7**
Second Semester		
CBIO 501	Biology Seminar [1]	0
CBIO XXX	Research in Biology	6
	Hours	**6**
Third Semester		
CBIO XXX	Research in Biology	2
CBIO 901		1
	Hours	**3**
	Total Hours	**73**

1. All Ph.D. graduate students must enroll and attend CBIO 501 Biology Seminar until matriculation.
2. All Ph.D. students are required to register this course to document three (3) semesters of teaching activity.
3. This course is required for the 4th or 5th Ph.D. candidate to present his/her thesis research in front of the audiences prior to thesis defense.