Department of Biology

The Department of Biology offers Master of Science degrees in Biology and Biotechnology, as well as Doctor of Philosophy degrees in Cell and Molecular Biology and Neurobiology.

- M.S. in Biology (p. 1)
- M.S. in Biotechnology (p. 3)
- Ph.D. in Cell and Molecular Biology (p. 4)
- Ph.D. in Neurobiology (p. 5)

Master of Science Degree in Biology

The graduate program offers opportunities for advanced study and research leading to the Master of Science degree in Biology. A thesis option is offered to students who want an opportunity to develop expertise in research techniques and data analysis; a non-thesis option is offered for those who want the opportunity to earn the Master of Science degree primarily through organized coursework. The thesis option is recommended for students who plan a career in research or contemplate pursuing a doctorate in one of the life sciences. The non-thesis option might be suitable for students interested in secondary school teaching in the life sciences.

Graduate faculty research interests include biochemistry, cellular biology, developmental biology, ecology, genetics, microbiology, neurobiology, physiology, and plant sciences. The multidisciplinary nature of the program also allows students the opportunity to broaden their educational background at the graduate level. Individual programs are organized around each student's interests in consultation with the student's graduate advisor.

Qualified students are encouraged to apply for teaching assistantships and fellowships.

Program Admission Requirements

To be considered for degree-seeking status, applicants must submit, along with the application, two letters of recommendation, a Statement of Future Plans, including a reason why you wish to pursue an M.S. in Biology, and scores from the Graduate Record Examination (GRE). In addition to satisfying the University-wide graduate admission requirements, applicants are expected to have completed an undergraduate major in one of the biological sciences, with coursework comparable to that required for the Bachelor of Science degree in Biology at UTSA. A minimum grade point average of 3.0 (on a 4.0 scale) is required for admission. Students whose undergraduate preparation is deficient in certain areas but who meet the minimum University standards for admission may be conditionally admitted and required to complete specific undergraduate or graduate courses as conditions of admission. In such cases, students should anticipate that additional time will be required to complete the degree. Students who are denied admission to the M.S. Program must reapply if interested in acceptance as a special graduate student or a non-degree-seeking student.

Degree Requirements

Degree-seeking students are required to complete a minimum of 36 semester credit hours that must be approved by the student's Graduate Advisor and Comprehensive Examination Committee, as well as the Graduate Advisor of Record. Students are expected to meet with their assigned Graduate Advisor early in the first semester of study to prepare a course-degree-plan and organize a Committee as early as possible. Students must work closely with their Advisor and Committee to gain maximum benefit from this program.

Program of Study

I. Thesis Options

A. Emphasis in Cell and Molecular Biology

The emphasis in Cell and Molecular Biology (CMB) is a thesis-track degree program designed to prepare students who may wish to pursue a Ph.D. in Biology with an emphasis in Cell and Molecular Biology at UTSA or elsewhere. The Master's level CMB emphasis provides a prospective student with the coursework and preliminary research background found in a successful CMB Ph.D. applicant. Core coursework is directly transferable toward the Ph.D. degree (if the student is accepted into the Ph.D. program), and elective coursework is also transferable if it was not used to fulfill requirements for the M.S. degree.

1. 6 semester credit hours of the following core lecture courses are required:
   - BIO 5113 Principles of Biochemistry
   - BIO 5123 Principles of Molecular Biology
   - BIO 5133 Principles of Cell Biology

2. 6 semester credit hours of research support courses are required:
   - BIO 7041 Biology Colloquium (repeated for a total of 3 hours)
   - BIO 7051 Seminar in Life Sciences (repeated for a total of 3 hours)

3. 12 semester credit hours from the following research-based courses are required:
   - BIO 5973 Directed Research
   - or BIO 6953 Independent Study
   - BIO 6983 Master's Thesis (repeated for a total of 6 hours)

4. 12 semester credit hours of electives from the following list are required:
   - BIO 5233 Medicinal Plants
   - BIO 5463 Reproductive Biology
   - BIO 5543 Pharmacology and Toxicology
   - BIO 5643 Bioinformatics and Computational Biology
   - BIO 5663 Applications of Recombinant DNA Technology
   - BIO 5833 Membrane Structure and Function
   - BIO 6313 Molecular Biology and Biophysics of Ion Channels
   - BIO 6513 Drug Development
   - BIO 6973 Special Problems

Total Credit Hours 36

B. Emphasis in Microbiology and Immunology

The emphasis in Microbiology and Immunology is a thesis-track degree program designed to prepare students who may wish to pursue a Ph.D. in Biology with an emphasis in Microbiology and Immunology at UTSA or elsewhere. This emphasis provides a prospective student with the coursework and preliminary research background found in a successful Ph.D. applicant. Core coursework is directly transferable toward the Ph.D. degree (if the student is accepted into the Ph.D. program), and elective coursework is also transferable if it was not used to fulfill requirements for the M.S. degree.
1. 6 semester credit hours of the following core lecture courses are required:
   - BIO 5113  Principles of Biochemistry
   - BIO 5123  Principles of Molecular Biology
   - BIO 5133  Principles of Cell Biology

2. 6 semester credit hours of research support courses are required:
   - BIO 7041  Biology Colloquium (repeated for a total of 3 hours)
   - BIO 7051  Seminar in Life Sciences (repeated for a total of 3 hours)

3. 12 semester credit hours from the following research-based courses are required:
   - BIO 5973  Directed Research
   - or BIO 6953  Independent Study
   - BIO 6983  Master's Thesis (repeated for a total of 6 hours)

4. 12 semester credit hours of electives from the following list are required:
   - BIO 5543  Pharmacology and Toxicology
   - BIO 5643  Bioinformatics and Computational Biology
   - BIO 5663  Applications of Recombinant DNA Technology
   - BIO 5743  Advanced Virology
   - BIO 6513  Drug Development
   - BIO 6533  Developmental Neurobiology
   - BIO 6803  Advanced Immunology and Immunochemistry
   - BIO 6883  Bacterial Pathogenesis
   - BIO 6973  Special Problems

Total Credit Hours 36

II. Non-Thesis Options

A. Open Emphasis

The open emphasis in Biology offers students the opportunity to acquire a sound preparation of the fundamentals in several areas of Biology, and to introduce students to recent advances in biological theory and methods.

1. 3 semester credit hours of the following core lecture courses are required:
   - BIO 5173  Principles of the Biological Sciences
   - BIO 5183  Biology of Learning

2. 9 credit hours of research support courses are required:
   - BIO 7041  Biology Colloquium (repeated for a total of 3 hours)
   - BIO 7051  Seminar in Life Sciences (repeated for a total of 3 hours)

3. 24 semester credit hours of electives from the following list are required:
   - BIO 5183  Biology of Learning
   - BIO 5233  Medicinal Plants
   - BIO 5423  Neuroanatomy
   - BIO 5433  Neurophysiology
   - BIO 5443  Molecular Neurobiology
   - BIO 5453  Neuroendocrinology
   - BIO 5463  Reproductive Biology
   - BIO 5473  Developmental Neurobiology
   - BIO 5483  Computational Neuroscience
   - BIO 5493  Cognitive Neuroscience
   - BIO 5533  Human Electrophysiology
   - BIO 5543  Pharmacology and Toxicology
   - BIO 5643  Bioinformatics and Computational Biology
   - BIO 5663  Applications of Recombinant DNA Technology
   - BIO 5743  Advanced Virology
   - BIO 5833  Membrane Structure and Function
   - BIO 6233  Quantitative Biology
   - BIO 6313  Molecular Biology and Biophysics of Ion Channels
   - BIO 6483  Animal Behavior
   - BIO 6513  Drug Development
   - BIO 6573  Microbial Pathogenesis
   - BIO 6803  Advanced Immunology and Immunochemistry
   - BIO 6883  Bacterial Pathogenesis

Total Credit Hours 36
Comprehensive Examination

As specified by University regulations, candidates must pass a comprehensive examination administered by the student’s Graduate Committee. For non-thesis students, this examination must be given in the semester prior to the semester during which degree requirements are to be completed. Students who do not achieve the criteria (or necessary expectations) to pass the exam will be required to enroll in BIO 6963 Critical Thinking & Writing for the Biological Sciences in the following semester and retake the examination. Certain rules must be adhered to concerning the composition of the Master’s Thesis Committee and the Master’s Comprehensive Examination Committee. Only tenured or tenure-track faculty members can chair these committees, and no more than one member of either committee can be a nontenured or nontenure-track faculty member, or be from another institution. Students electing the thesis option must successfully defend their thesis research before their Graduate Committee prior to the submission of the thesis to the Dean of the Graduate School for approval.

Master of Science Degree in Biotechnology

The Master of Science degree in Biotechnology offers opportunities for rigorous, advanced study and research in biotechnology, in order to prepare students for employment and research in this rapidly advancing and expanding field. A broad common base of knowledge for biotechnology is provided in the Master’s degree by a comprehensive core curriculum that includes key areas in biochemistry, cell and molecular biology, and immunology. All students receive practical training through the completion of at least two laboratory courses. Additional coursework is selected from a list of approved lecture based and laboratory courses, and can include up to 9 hours of biomedical engineering lectures, or 12 hours on aspects of management of biotechnology. The opportunity to gain research experience or develop further technical expertise is also possible through an internship in a biotechnology-based company or by conducting a Master’s thesis.

Program Admission Requirements

To be considered for degree-seeking status, applicants must submit, along with the application, two letters of recommendation, a Statement of Future Plans for a career in Biotechnology, and scores from the Graduate Record Examination (GRE). In addition to satisfying the University-wide graduate admission requirements, applicants are expected to have completed an undergraduate major in the sciences with coursework comparable to the core required for the Bachelor of Science degree in Biology at UTSA. In particular, incoming students are required to have taken, and received at least a grade of “B” in upper-division undergraduate lecture and laboratory courses in cell biology and biochemistry, and to have taken undergraduate courses in molecular biology and immunology. Students whose undergraduate preparation is deficient in one of these areas of requirements but who meet the remaining standards for admission may be conditionally admitted and required to complete specific undergraduate course(s) as a condition of admission. In such cases, students should anticipate that additional time will be required to complete the degree. A minimum grade point average of 3.0 (on a 4.0 scale) is required for admission. Students who are denied admission to this M.S. program must reapply if interested in acceptance as a special graduate student or a non-degree-seeking student. The nature of the program dictates the number of students admitted each year is limited.

Degree Requirements

Degree-seeking students are required to complete a minimum of 36 semester credit hours that must be approved by the student’s Graduate Advisor and Comprehensive Examination Committee, as well as the Graduate Advisor of Record. Students are expected to meet with their assigned Graduate Advisor early in the first semester of study to prepare a course-degree-plan and organize a Committee as early as possible. Students must work closely with their Advisor and Committee to gain maximum benefit from this program.

Program of Study

A. Biotechnology lectures – core curriculum: 12

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 5001</td>
<td>Ethical Conduct in Research</td>
</tr>
<tr>
<td>BIO 5123</td>
<td>Principles of Molecular Biology</td>
</tr>
<tr>
<td>BIO 5133</td>
<td>Principles of Cell Biology</td>
</tr>
<tr>
<td>BIO 5323</td>
<td>Biochemistry for Biotechnology</td>
</tr>
<tr>
<td>BIO 5762</td>
<td>Fundamentals of Immunology for Biotechnology</td>
</tr>
</tbody>
</table>

B. 3 semester credit hours in basic laboratory techniques are required: 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 5033</td>
<td>Biotechnology Laboratory</td>
</tr>
</tbody>
</table>

C. A minimum of 3 semester credit hours of additional organized laboratory experience are required from the following: 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 5143</td>
<td>Advanced Nucleic Acids Laboratory</td>
</tr>
<tr>
<td>BIO 5163</td>
<td>Recombinant Protein Biotechnology Laboratory</td>
</tr>
<tr>
<td>BIO 7571</td>
<td>Experimental Techniques in Biology</td>
</tr>
<tr>
<td>BIO 7572</td>
<td>Experimental Techniques in Biology</td>
</tr>
</tbody>
</table>

D. Applications of Biotechnology electives 6-18

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 5213</td>
<td>Principles of Chemical Biology</td>
</tr>
<tr>
<td>BIO 5343</td>
<td>Proteins and Nucleic Acids</td>
</tr>
<tr>
<td>BIO 5543</td>
<td>Pharmacology and Toxicology</td>
</tr>
<tr>
<td>BIO 5663</td>
<td>Applications of Recombinant DNA Technology</td>
</tr>
<tr>
<td>BIO 5673</td>
<td>Analysis of Next Generation Sequence Data</td>
</tr>
<tr>
<td>BIO 5783</td>
<td>Introduction to Good Manufacturing Practices and Good Laboratory Practices</td>
</tr>
<tr>
<td>BIO 5873</td>
<td>Plant Biotechnology</td>
</tr>
<tr>
<td>BIO 5971</td>
<td>Directed Research</td>
</tr>
<tr>
<td>BIO 5972</td>
<td>Directed Research</td>
</tr>
<tr>
<td>BIO 5973</td>
<td>Directed Research</td>
</tr>
<tr>
<td>BIO 6323</td>
<td>Essentials of Biostatistics for Biotechnology</td>
</tr>
<tr>
<td>BIO 6513</td>
<td>Drug Development</td>
</tr>
<tr>
<td>BIO 6983</td>
<td>Master’s Thesis (repeated for a total of 6 hours)</td>
</tr>
<tr>
<td>BIO 7563</td>
<td>Practicum in Biotechnology</td>
</tr>
<tr>
<td>BIO 7566</td>
<td>Practicum in Biotechnology</td>
</tr>
<tr>
<td>BME 6923</td>
<td>Tissue Engineering</td>
</tr>
<tr>
<td>BME 6933</td>
<td>Tissue-Biomaterials Interactions</td>
</tr>
<tr>
<td>BME 6943</td>
<td>Biomaterials and Cell Signaling</td>
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</tbody>
</table>

E. Management of Biotechnology 0-12

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOT 5163</td>
<td>Management of Technology</td>
</tr>
<tr>
<td>MOT 5173</td>
<td>Technology Transfer: The Theory and Practice of Knowledge Utilization</td>
</tr>
<tr>
<td>MOT 5223</td>
<td>Management of Professional Personnel</td>
</tr>
</tbody>
</table>
Degree Requirements

The degree requires a minimum of 85 semester credit hours beyond the baccalaureate degree for the Ph.D. in Cell and Molecular Biology. The curriculum consists of core courses, elective courses, seminars, required teaching, research, and completion of the dissertation following advancement to candidacy. Any grade lower than “B” in a graduate course or in remedial coursework at the undergraduate level will not count toward the minimum number of required hours. Students matriculating with a Master’s degree may use up to 30 semester credit hours toward the degree provided the courses are comparable to core and elective courses and are approved by the appropriate Doctoral Studies Committee.

A. Core curriculum (18 semester credit hours required): 18
   - BIO 5123 Principles of Molecular Biology
   - BIO 5133 Principles of Cell Biology
   - BIO 5213 Principles of Chemical Biology
   - BIO 7113 Supervised Teaching in Biology
   - BIO 7143 Principles of Biological Scientific Writing
   - BIO 7571 Experimental Techniques in Biology
   - BIO 7572 & BIO 7572 Experimental Techniques in Biology

B. Colloquia (10 semester credit hours minimum—a minimum of 1 credit hour each semester throughout tenure in the program): 10
   - BIO 7041 Biology Colloquium

C. Doctoral research (48 semester credit hours minimum): 48
   - BIO 7211 Doctoral Research (before admission to candidacy)
   - BIO 7212 Doctoral Research (before admission to candidacy)
   - BIO 7213 Doctoral Research (before admission to candidacy)
   - BIO 7311 Doctoral Dissertation (for Ph.D. candidates)
   - BIO 7312 Doctoral Dissertation (for Ph.D. candidates)
   - BIO 7313 Doctoral Dissertation (for Ph.D. candidates)

D. Electives (9 semester credit hours minimum): 9
   - These can be selected from any 5000–7000 level courses offered in Biology or from any 5000–7000 level courses offered in other departments with the approval of the Cell and Molecular Biology Doctoral Studies Committee.

Total Credit Hours 85

The entire program of study must be approved by the student’s dissertation advisor and the Cell and Molecular Biology Doctoral Studies Committee, and must be submitted to the Dean of the Graduate School for final approval.

Molecular Microbiology and Immunology Track

The primary objective of the track in Molecular Microbiology and Immunology is to provide graduates with advanced academic and research training in all aspects of Microbiology and Immunology, especially in those areas that pertain to infectious diseases. This track will provide expertise in bacteriology, virology, parasitology, mycology, immunology, vaccinology, biodefense, and molecular genetics. The information derived from research in this area has an enormous impact on biology and medicine.

Students in this track follow the regular core curriculum for the concentration in Cell and Molecular Biology; however, their Doctoral
Dissertation topic, proposal and research need to be in an area related to Microbiology and Immunology. Likewise, students are also encouraged to select the majority of their elective courses and colloquia from those offered that are broadly related to the field of Microbiology and Immunology. The overall program of study for this track may differ by no more than 12 semester credit hours from the program of study for the regular concentration in Cell and Molecular Biology and must be approved by the student’s Dissertation Advisor and the Cell and Molecular Biology Doctoral Studies Committee.

**Stem Cell Biology Track**

Stem Cell Biology is a rapidly emerging field rooted in basic principles of Cell and Molecular Biology that has provided new avenues to investigate normal cellular and developmental processes as well as novel approaches to learning more about and/or treating complex diseases and other debilitating conditions. The Stem Cell Biology Track will allow students pursuing their doctoral degree in Cell and Molecular Biology the opportunity to focus on Stem Cell Biology, including topics related to the basic biology of stem cells (from any species) as well as those related to translational research involving potential contributions of stem cells to tissue engineering or other therapeutic approaches. This will include, but is not limited to, molecular biology of stem cells, cell biology of stem cells, epigenetic programming in stem cells, maintenance of genetic integrity in stem cells, and the use of stem cells to study disease etiology, and will be based on studies of embryonic stem cells, induced pluripotent stem cells, germine stem cells, neural stem cells, mesenchymal stem cells or other tissue-specific stem cells, as well as stem cells from non-mammalian organisms including lower vertebrates, microorganisms and/or plants.

Students in this track will follow the standard curriculum and program of study for the concentration in Cell and Molecular Biology; however, their Doctoral Dissertation topic, proposal and research must be in an area related to Stem Cell Biology. Among the three elective courses required for the standard Cell and Molecular Biology program of study, students in this track will be required to take two courses focused on Stem Cell Biology—Cell Biology of Stem Cells and Molecular Biology of Stem Cells. Finally, students in the Stem Cell Biology track will be required to enroll in colloquia that address topics related to Stem Cell Biology. The overall program of study for this track may differ by no more than 12 semester credit hours from the standard program of study for the concentration in Cell and Molecular Biology and must be approved by the student’s Dissertation Advisor, a subcommittee that will oversee the Stem Cell Biology Track, and the Cell and Molecular Biology Doctoral Studies Committee.

**Advancement to Candidacy**

Advancement to candidacy requires a student to complete University and program requirements and to pass written and oral qualifying examinations following completion of course requirements. The examination is administered by the Doctoral Studies Committee of each concentration and is conducted as outlined in the Handbook of Academic Policies and Procedures for each concentration. No more than two attempts to pass qualifying examinations are allowed. Results of the written and oral examinations must be reported to the appropriate Doctoral Studies Committee and the Dean of the Graduate School. Admission into the Doctoral program does not guarantee advancement to candidacy.

**Dissertation**

Candidates must demonstrate their ability to conduct independent research by completing and defending an original dissertation. The research topic is determined by the student in consultation with their supervising professor and a Dissertation Committee. The Dissertation Committee is selected by the student and supervising professor and approved by 1) the Doctoral Studies committee; 2) the Department Chair; 3) the Dean of the College; and 4) the Dean of the Graduate School. The Dissertation Committee guides and critiques the candidate’s research. The Committee is composed of four program faculty and one outside member. The Dissertation Committee must approve the completed dissertation.

**Final Oral Examination**

Following an open presentation of the dissertation findings, the Dissertation Committee conducts a closed oral examination dealing primarily with the relation of the dissertation to the general field of specialty. Results of the oral examination must be reported to the Dean of the Graduate School. Awarding of the degree is based on the approval of the Dissertation Committee, which is approved by relevant Doctoral Studies Committee, the Department Chair, and the Dean of the Graduate School. The Dean of the Graduate School certifies the completion of all University-wide requirements.

**Doctor of Philosophy Degree in Neurobiology**

The Department of Biology offers opportunities for advanced study and research leading to the Doctor of Philosophy degree in Neurobiology. The Ph.D. in Neurobiology is awarded to candidates who have displayed an in-depth understanding of the subject matter and demonstrated the ability to make an original contribution to knowledge in their specialized area of study.

The regulations for this degree comply with the general University regulations (refer to Chapter 2, General Academic Regulations, and Chapter 5, Doctoral Degree Regulations).

**Admission Requirements**

Applicants must have a Bachelor of Arts or a Bachelor of Science degree, preferably in biology, from an accredited university and a minimum grade point average of 3.0 in upper-division and graduate work. Applicants must submit, along with the application, three letters of recommendation, a Statement of Future Plans, and scores from the Graduate Record Examination (GRE). Applicants whose native language is not English must score at least 600 on the Test of English as a Foreign Language (TOEFL) paper version or 100 on the Internet version. Admission requires appointment to a teaching assistantship, research assistantship, or research fellowship. The Doctoral Studies Committees is comprised of members selected from the graduate faculty and are responsible for reviewing applications for admission.

**Degree Requirements**

The degree requires a minimum of 85 semester credit hours beyond the baccalaureate degree for the concentration Ph.D. in Neurobiology. The curriculum consists of core courses, elective courses, seminars, required teaching, research, and completion of the dissertation following advancement to candidacy. Any grade lower than “B” in a graduate course or in remedial coursework at the undergraduate level will not count toward the minimum number of required hours. Students matriculating with a Master’s degree may use up to 30 semester credit hours toward the degree provided the courses are comparable to
core and elective courses and are approved by the Doctoral Studies Committee.

A. Core curriculum (18 semester credit hours required):

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>BIO 5423</td>
<td>Neuroanatomy</td>
</tr>
<tr>
<td>BIO 5433</td>
<td>Neurophysiology</td>
</tr>
<tr>
<td>BIO 5443</td>
<td>Molecular Neurobiology</td>
</tr>
<tr>
<td>BIO 6233</td>
<td>Quantitative Biology</td>
</tr>
<tr>
<td>BIO 7113</td>
<td>Supervised Teaching in Biology</td>
</tr>
</tbody>
</table>

Select 3 semester credit hours of the following:

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>BIO 7571</td>
<td>Experimental Techniques in Biology</td>
</tr>
<tr>
<td>BIO 7572</td>
<td>Experimental Techniques in Biology</td>
</tr>
</tbody>
</table>

B. Colloquia (10 semester hours minimum – a minimum of 1 credit hour each Fall and Spring semester):

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 7041</td>
<td>Biology Colloquium</td>
</tr>
</tbody>
</table>

C. Doctoral research (48 semester credit hours minimum):

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 7211</td>
<td>Doctoral Research (before admission to candidacy)</td>
</tr>
<tr>
<td>BIO 7212</td>
<td>Doctoral Research (before admission to candidacy)</td>
</tr>
<tr>
<td>BIO 7213</td>
<td>Doctoral Research (before admission to candidacy)</td>
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<tr>
<td>BIO 7311</td>
<td>Doctoral Dissertation (for Ph.D. candidates)</td>
</tr>
<tr>
<td>BIO 7312</td>
<td>Doctoral Dissertation (for Ph.D. candidates)</td>
</tr>
<tr>
<td>BIO 7313</td>
<td>Doctoral Dissertation (for Ph.D. candidates)</td>
</tr>
</tbody>
</table>

D. Electives (9 semester credit hours minimum):

These can be selected from any 5000–7000 level courses offered in Biology or from any 5000–7000 level courses offered in other departments with the approval of the Neurobiology Doctoral Studies Committee.

Total Credit Hours 85

1 Enrollment in BIO 7041 Biology Colloquium is required every Fall Semester and is optional in Spring Semesters.

The entire program of study must be approved by the student’s dissertation advisor, dissertation committee, and the Neurobiology Doctoral Studies Committee, and must be submitted to the Dean of the Graduate School for final approval.

**Advancement to Candidacy**

Advancement to candidacy requires a student to complete University and program requirements and to pass written and oral qualifying examinations following completion of course requirements. The examination is administered by the Doctoral Studies Committee of each concentration and is conducted as outlined in the Handbook of Academic Policies and Procedures for each concentration. No more than two attempts to pass qualifying examinations are allowed. Results of the written and oral examinations must be reported to the appropriate Doctoral Studies Committee and the Dean of the Graduate School. Admission into the Doctoral program does not guarantee advancement to candidacy.

**Dissertation**

Candidates must demonstrate their ability to conduct independent research by completing and defending an original dissertation. The research topic is determined by the student in consultation with their supervising professor and a Dissertation Committee. The Dissertation Committee is selected by the student and supervising professor and approved by 1) the Doctoral Studies committee; 2) the Department Chair; 3) the Dean of the College; and 4) the Dean of the Graduate School. The Dissertation Committee guides and critiques the candidate’s research. The Committee is composed of four program faculty and one outside member. The Dissertation Committee must approve the completed dissertation.

**Final Oral Examination**

Following an open presentation of the dissertation findings, the Dissertation Committee conducts a closed oral examination dealing primarily with the relation of the dissertation to the general field of specialty. Results of the oral examination must be reported to the Dean of the Graduate School. Awarding of the degree is based on the approval of the Dissertation Committee, which is approved by relevant Doctoral Studies Committee, the Department Chair, and the Dean of the Graduate School. The Dean of the Graduate School certifies the completion of all University-wide requirements.