THE PROGRAM
The Ph.D. Program in Biology offers graduate studies in four broad areas of concentration: ecology, evolutionary biology, and behavior; molecular, cellular, and developmental biology; neuroscience; and plant sciences. The faculty and their research laboratories are based at six campuses (Brooklyn, City, Hunter, Lehman, and Queens colleges and the College of Staten Island) and several affiliated institutions (the American Museum of Natural History, the New York Botanical Garden, and the Institute for Basic Research). The Ph.D. is awarded by the Graduate School and University Center of the City University of New York, through which an en-route M.A. degree may also be awarded. The Graduate Center administers the program through the Executive Officer for the Ph.D. Program in Biology, an Executive Committee, which includes student representatives, and an advisory committee representing each of the above subject areas.

The course of study is determined by the student’s background and selected area of interest. Guidance is initially provided by the Graduate Deputy Chair at the campus at which the student is based and overseen by the program office and the appropriate advisory committee. During the first year, study is directed toward preparation for the First Examination, which is offered annually in the four above-mentioned subject areas. In the second year, students pursue more specialized work under the guidance of their mentor and advisory committee, directed toward the knowledge and techniques necessary to become an effective research scientist. Students may take courses or use facilities located at any unit of CUNY or at the affiliated institutions. Laboratory and field studies stress independent research—training that should enable the student to evaluate related literature critically and to respond successfully to future advances in his or her field. Advanced seminars, colloquia, tutorials, lectures by visiting scientists, and other student-faculty contacts also contribute to the widening of the student’s outlook and experience.

Courses
Diverse course offerings within each of the four major areas of specialization provide students with the basic knowledge and skills on which to build for more specialized training and research. The areas vary in the manner by which students are directed in their initial year in the program. The areas of molecular, cellular, and developmental biology and neuroscience recommend a more directed “core” of three to four basic courses. On the other hand, students in the ecology, evolutionary biology, and behavior and plant sciences areas are, in consultation with an adviser, directed toward courses most appropriate to their career aims and research directions. The ultimate aim of a student’s first year in the program is to develop the comprehensive background necessary to complete the First Examination successfully in the chosen area.

Advanced-level courses, along with seminars, tutorials, and advanced-study courses as well as courses offered by other Ph.D. programs (Biochemistry, Earth and Environmental Sciences, Psychology, etc.), complete the menu of offerings from which the student and the adviser may choose. In addition, students may take up to 10 credits of independent doctoral research.
Each semester, the program office compiles a listing of course offerings, including the name of the professor(s) and a paragraph describing the course. Students should also consult the listing of faculty and specializations in order to select opportunities for potential research areas.

**En-route M.A.**

Upon completing 45 credits with an average grade of B, passing the First Examination, and satisfactorily completing a major research paper, the student may apply for an M.A. degree. Those seeking an en-route master’s degree should have the Executive Officer initiate the appropriate action. The degree is awarded formally by one of the participating CUNY senior colleges.

**SPECIAL REQUIREMENTS FOR ADMISSION**

In addition to the general requirements for admission stated earlier in this bulletin, undergraduate preparation should include an adequate background in biology, chemistry, physics, and mathematics, including morphology, physiology, genetics, biochemistry or organic chemistry, and calculus or statistics. The Admissions Committee considers basic training in the sciences and mathematics and the capacity for independent study to be more important than the completion of specific undergraduate courses. Students trained in fields other than biology may apply and may be admitted with conditions determined by the Admissions Committee. The deadline for admission in the fall semester is February 1.

**SPECIAL REQUIREMENTS FOR THE DOCTOR OF PHILOSOPHY**

The following requirements are in addition to the general University requirements for the Ph.D. stated earlier in this bulletin.

**Course of Study** A minimum of 60 credits of approved course work is required for a Ph.D. in biology. The student must follow an approved program of study, which will be prepared in consultation with an advisory committee and filed with the Executive Officer. The first year’s work will normally include a number of fundamental courses designed to complete the students’ basic preparation in the areas of biology to be covered by the First Examination and second-level courses to prepare them for their areas of specialization. Certain campuses offer course prescriptions for first-year students (inquire at individual campuses for details). The program of study for each student will be planned by the student and an advisory committee so as best to meet the student’s interests and needs.

Of the 60 graduate credits required for the degree, no more than 9 may be offered in lower-level (60000) graduate courses. These courses are listed in the program handbook and the college graduate bulletins. The remainder of the graduate credits must be in second- and third-level graduate courses. Students should consult with their advisory committee concerning prerequisites for these courses. A maximum of 20 credits in a minor approved by the student’s graduate committee will be accepted. No more than 10 credits of independent Ph.D. dissertation research may be accepted as part of the 60 graduate credits required. A summer of field or laboratory work at a biological station is recommended and may be required in some areas. After completion of formal course work and advancement to candidacy, the candidate must register for BIOL 90000 Dissertation Supervision until the degree is completed.

The student’s record will be evaluated at the end of each academic year, and matriculation may be terminated for unsatisfactory scholastic performance. A time limit of six years is set for the completion of all requirements for the degree, except for the writing and defense of the dissertation. The maximum time period for the completion of all requirements is eight years (seven years for those entering with a master’s degree).

**First Examination** This examination tests a graduate student’s ability to think, synthesize information, and solve problems in one of the following areas of biology: molecular, cellular, and developmental biology, plant sciences, neuroscience, or ecology, evolutionary biology, and behavior. This examination is normally taken after completion of two semesters in the program, but may be taken earlier with permission of the campus advisory committee. Students who fail this examination will be permitted one additional opportunity to take and pass any of the four examinations the next time they are given. Students who do not take this examination at the time specified by their advisory committee and the Executive Officer will be judged as having failed the examination.
Foreign Language and Research Techniques An individual’s research mentor and advisory committee with the approval of the Executive Committee may require a student to acquire functional mastery of computer programming or a working knowledge of a foreign language or languages in which there is a substantial body of literature relevant to the student’s research. Should the student be required to develop such skills, the Executive Officer should be notified of this requirement, in writing by the student’s mentor, no later than the student’s fourth semester.

Second Examination Students must demonstrate advanced understanding and research competence in their areas of specialization and related fields in biology by passing the Second Examination. This oral examination, administered by the student’s examination committee, is normally taken after fulfilling any language requirement and a minimum of 30 credits of course work.

Dissertation Before enrolling for dissertation work, the student must have passed the Second Examination and must be accepted by a faculty sponsor. The student’s thesis research proposal must be approved by an advisory committee and must be judged by this committee to be of a caliber warranting publication in approved journals. After completion of the dissertation, the student must pass a final examination, which will be a defense of the dissertation. The final examination is given by a committee, including the student’s advisory committee and additional members from both within and outside the University.

College Teaching and Field Experience A minimum of two semesters of teaching experience is required. In those subdisciplines of biology where field experience is considered to be particularly appropriate by the student’s advisory committee, such experience may take the place, wholly or in part, of the teaching experience requirement. As part of their training for future roles including those as teachers in colleges and universities, graduate students, where possible, may be required to teach more than one year and to acquire experience in teaching several different courses in biology at the elective as well as at the elementary level. Teaching assignments serve as a principal means of support for biology graduate students.

Courses

60000-level graduate courses are listed in the graduate bulletins of City, Hunter, Brooklyn, Queens, and Lehman colleges. A maximum of 9 credits in such courses may be offered toward the Ph.D. degree. 70000- and 80000-level graduate courses creditable toward the doctoral degree are listed below. Each course is offered periodically at one or more units of the University as indicated. Courses listed under the same number cover substantially similar material at comparable levels. For course descriptions consult the several graduate bulletins of each college of the University. The prerequisite for admission to all courses is prior approval by the student’s advisory committee.

Ecology, Evolutionary Biology, and Behavior
BIOL 70003 Genetics: Lecture
   30 or 45 hours lecture, 2 or 3 credits
BIOL 70004* Genetics: Laboratory
   60 or 90 hours laboratory, 2 or 3 credits
BIOL 70005 Genetics: Lecture
   60 or 75 hours lecture, 4 or 5 credits
   Prerequisite: Undergraduate genetics and molecular biology or biochemistry
BIOL 70006* Genetics: Lecture
   45 hours lecture, 3 credits
BIOL 70007 Conservation Biology
   45 hours, 3 credits
BIOL 70103* Microbial Genetics
   45 hours lecture, 3 credits
BIOL 70104* Problems in Microbial Genetics: Laboratory
   90 hours laboratory, 3 credits
BIOL 70201* Genetics of Multicellular Organisms, I
   45 hours lecture, 3 credits
BIOL 70202* Genetics of Multicellular Organisms, II  
45 hours lecture, 3 credits

BIOL 70301* 70302 Cell Heredity I, II  
45 hours lecture, 3 credits each semester

BIOL 70503 Evolution  
30 or 45 hours lecture, 2 or 3 credits

BIOL 70504* Evolution: Laboratory  
60 hours laboratory, 2 credits

BIOL 70505* The Evolutionary Biology of Vertebrates  
45 hours lecture, 3 credits

BIOL 70506* Macroevolution: Patterns of Evolution above the Species Level  
45 hours, 3 credits

BIOL 70603 Principles of Systematics  
45 hours lecture plus conferences, 4 credits

BIOL 70604* Animal Systematics: Laboratory  
60 or 90 hours laboratory, 2 or 3 credits

BIOL 70609* Biological Museology  
45 hours, 3 credits

BIOL 70611* Systematics and Evolution of Insects and Arachnids: Lecture  
2 hours, 2 credits

BIOL 70612* Systematics and Evolution of Insects and Arachnids: Laboratory  
4 hours, 2 credits

BIOL 70607 Plant Molecular Systematics Lecture

BIOL 70713* Zoology and Phylogeny of Chordata (Fishes)  
30 hours lecture, 2 credits

BIOL 70714* Zoology and Phylogeny of Chordata (Fishes)  
60 hours laboratory, 2 credits

BIOL 70723* Zoology and Phylogeny of Chordata (Reptiles and Amphibians)  
30 hours lecture, 2 credits

BIOL 70724* Zoology and Phylogeny of Chordata (Reptiles and Amphibians)  
60 hours laboratory, 2 credits

BIOL 70733 Zoology and Phylogeny of Chordata (Mammals)  
30 hours lecture, 2 credits

BIOL 70734 Zoology and Phylogeny of Chordata (Mammals)  
60 hours laboratory, 2 credits

BIOL 70735* Functional and Adaptational Biology of the Mammalia  
45 hours, 3 credits  
Prerequisite: 70733, 70734

BIOL 70743* Zoology and Phylogeny of Chordata (Birds)  
30 hours lecture, 2 credits

BIOL 70744* Zoology and Phylogeny of Chordata (Birds)  
60 hours laboratory, 2 credits

BIOL 70800* Biochemical Evolution and Systematics  
45 hours lecture, 3 credits

BIOL 70803 Molecular Evolution  
45 hours, 3 credits

BIOL 70901 Population Genetics: Lecture  
45 hours lecture, 3 credits

BIOL 70902* Population Genetics: Laboratory  
90 hours laboratory, 3 credits

BIOL 70903* Quantitative Genetics  
45 hours lecture, 3 credits

BIOL 70907* Behavior Genetics  
30 hours lecture, 120 hours laboratory, 4 credits
BIOL 72403* Animal Behavior I: Lecture
45 hours lecture, 3 credits
BIOL 72404* Biological Basis of Animal Behavior: Laboratory
90 hours laboratory, 3 credits
BIOL 72405* Current Issues in Behavioral Ontogeny
45 hours lecture, 3 credits
BIOL 72406* Behavior and Evolution
45 hours lecture, 3 credits
BIOL 72407* Animal Behavior II
45 hours, 3 credits
BIOL 72505* Animal Communication: Lecture
45 hours lecture, 3 credits
BIOL 72800* Field Studies in Animal Behavior
90 hours fieldwork and conferences, 3 credits
BIOL 73103* Microbial Ecology: Lecture
30 hours lecture, 2 credits
BIOL 73104* Microbial Ecology: Laboratory
90 hours laboratory, 3 credits
BIOL 74103* Radiation Biology: Lecture
30 or 45 hours lecture, 2 or 3 credits
BIOL 74104* Radiation Biology: Laboratory
60 or 90 hours laboratory, 2 or 3 credits
BIOL 75302 Phytoinformatics Lecture & Lab
30 hours lecture, 60 hours laboratory, 4 credits
BIOL 76001* Ecology: Lecture
45 hours lecture, 3 credits
BIOL 76002* Ecology: Laboratory and Field Study
90 hours laboratory, 3 credits
BIOL 76003* Community Ecology: Lecture
45 hours lecture, 3 credits
BIOL 76004* Community Ecology: Laboratory
90 hours laboratory, 3 credits
BIOL 76005* Population Ecology: Lecture
45 hours lecture, 3 credits
BIOL 76006* Population Ecology: Laboratory
90 hours laboratory, 3 credits
BIOL 76007* Limnology: Lecture
45 hours lecture, 3 credits
BIOL 76008* Limnology: Laboratory
90 hours laboratory, 3 credits
BIOL 76101* Marine Plankton Dynamics: Lecture
45 hours lecture, 3 credits
BIOL 76102* Marine Plankton Dynamics: Laboratory
90 hours laboratory and field trips, 3 credits
BIOL 76103* Marine Benthos: Lecture
45 hours lecture, 3 credits
BIOL 76104* Marine Benthos: Laboratory
90 hours laboratory and field trips, 3 credits
BIOL 76105* Fishes and Fisheries Biology: Lecture
45 hours lecture, 3 credits
BIOL 76106* Fishes and Fisheries Biology: Laboratory
90 hours laboratory, 3 credits
BIOL 76107* Marine Microbiology: Lecture
45 hours lecture, 3 credits
BIOL 76108* Marine Microbiology: Laboratory
90 hours laboratory and field trips, 3 credits
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lecture/Lab Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 76113*</td>
<td>Marine Ecology: Lecture</td>
<td>30 hours</td>
<td>2</td>
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<tr>
<td>BIOL 76114*</td>
<td>Marine Ecology: Laboratory</td>
<td>60 hours</td>
<td>2</td>
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<tr>
<td>BIOL 76200*</td>
<td>Physiological Ecology: Lecture</td>
<td>45 hours</td>
<td>3</td>
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<tr>
<td>BIOL 76201*</td>
<td>Physiological Ecology: Laboratory</td>
<td>90 hours</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 76701*</td>
<td>The Biology of Fishes</td>
<td>45 hours</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 76702*</td>
<td>The Biology of Fishes</td>
<td>90 hours</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 76830*</td>
<td>World Vegetation</td>
<td>45 hours</td>
<td>3</td>
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<tr>
<td>BIOL 77200</td>
<td>Biological Electron Microscopy</td>
<td>30 hours lecture</td>
<td>4</td>
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<tr>
<td>BIOL 78001</td>
<td>Mathematical Biology: Lecture</td>
<td>30 hours</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 78002</td>
<td>Mathematical Biology: Laboratory</td>
<td>60 or 90 hours</td>
<td>2 or 3</td>
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<tr>
<td>BIOL 78101*</td>
<td>Advanced Mathematical Biology: Lecture</td>
<td>30 hours</td>
<td>3</td>
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<tr>
<td>BIOL 78102*</td>
<td>Advanced Mathematical Biology: Laboratory</td>
<td>60 or 90 hours</td>
<td>2 or 3</td>
</tr>
<tr>
<td>BIOL 78201</td>
<td>Biostatistics I</td>
<td>Lecture/Laboratory</td>
<td>6 credits</td>
</tr>
<tr>
<td>BIOL 78202*</td>
<td>Biostatistics II</td>
<td>Lecture/Laboratory</td>
<td>6 credits</td>
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<tr>
<td>BIOL 79001</td>
<td>Colloquium in Ecology, Evolution, and Behavior</td>
<td>15 hours</td>
<td>1</td>
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<tr>
<td>BIOL 79030</td>
<td>Seminar in Ecology, Evolution, and Behavior</td>
<td>15 hours</td>
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<tr>
<td>BIOL 80803*</td>
<td>Microevolutionary Processes: Lecture</td>
<td>30 or 45 hours</td>
<td>2 or 3</td>
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<tr>
<td>BIOL 80804*</td>
<td>Microevolutionary Processes: Laboratory</td>
<td>60 or 90 hours</td>
<td>2 or 3</td>
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</table>

**Molecular, Cellular, and Developmental Biology**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lecture/Lab Hours</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOL 70400*</td>
<td>Problems in Nuclear Cytology</td>
<td>30 hours</td>
<td>4</td>
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<tr>
<td>BIOL 70610</td>
<td>Biological Systematics</td>
<td>30 hours</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 70801*</td>
<td>Developmental Genetics: Lecture</td>
<td>45 hours</td>
<td>3</td>
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<tr>
<td>BIOL 70802*</td>
<td>Developmental Genetics: Laboratory</td>
<td>90 hours</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 71013</td>
<td>Molecular Biology: Lecture</td>
<td>75 hours</td>
<td>5</td>
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<tr>
<td>BIOL 71014*</td>
<td>Molecular Biology: Laboratory</td>
<td>15 hours</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 71015</td>
<td>Molecular Biology: Lecture</td>
<td>60 hours</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 71016*</td>
<td>Molecular Biology: Laboratory</td>
<td>90 hours</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 71101</td>
<td>Laboratory Rotation</td>
<td>2 to 6 credits</td>
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</tbody>
</table>
BIOL 71103* Experimental Microbiology: Lecture
  45 hours lecture, 3 credits
BIOL 71104* Experimental Microbiology: Laboratory
  90 hours laboratory, 3 credits
BIOL 71203* Comparative Biochemistry: Lecture
  30 hours lecture plus conferences or 45 hours lecture; 3 credits
BIOL 71204* Comparative Biochemistry: Laboratory
  60 or 90 hours laboratory, 2 or 3 credits
BIOL 71300* Biology of Aging
  45 hours lecture, 3 credits
BIOL 71401 Cell Biology: Lecture
  60 or 75 hours lecture, 4 or 5 credits
BIOL 71402* Cell Biology: Laboratory
  180 hours laboratory, 6 credits
BIOL 71403* Cell Biology: Lecture
  30 hours lecture, 2 credits
BIOL 71404* Cell Biology: Laboratory
  90 hours laboratory, 3 credits
BIOL 71405 Current Topics in Cellular Signaling
  45 hours lecture, 3 credits, permission of instructor required
BIOL 71500* Cell Biology Internship
  20 hours week, literature assignments and laboratory work, 10 credits
BIOL 71600* Cells in Culture
  60 hours laboratory, 15 hours recitation, 3 credits
BIOL 71700* Bacteriophage
  45 hours lecture, 3 credits
BIOL 71710* Virology
  45 hours lecture, 3 credits
BIOL 71800 Immunology
  45 or 60 hours, 3 or 4 credits
BIOL 71903 Medical Microbiology and Immunology
  67.5 hours lecture, 22.5 hours laboratory, 22.5 hours conference, 6 credits
  Prerequisite: BIOL 71800 or equivalent and permission of instructor
BIOL 74000* Introduction to Biophysics
  45 hours lecture, 3 credits
BIOL 74001* Biophysical Techniques in Physiology
  90 hours laboratory, 3 credits
BIOL 74200* Radioisotopes in Biology
  60 hours lecture, laboratory and demonstrations, 4 credits
BIOL 74300* Photobiology
  45 hours lecture, 3 credits
BIOL 74400* Electrophysiology
  45 hours lecture, 3 credits
BIOL 74700* Structure and Metabolism of Macromolecules
  30 hours lecture, 30 hours laboratory, 3 credits
BIOL 75003 Developmental Biology: Lecture
  45, 60, or 75 hours lecture, 3, 4, or 5 credits
BIOL 75004* Developmental Biology: Laboratory
  60 or 90 hours laboratory, 2 or 3 credits
BIOL 75101* Special Problems in Developmental Biology: Lecture
  30 hours lecture, 2 credits
BIOL 75102* Special Problems in Developmental Biology: Laboratory
  60 hours laboratory, 2 credits
BIOL 75301 Computational Molecular Biology: Lecture and Laboratory
  60 hours, 3 credits
### Biology

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lecture Hours</th>
<th>Laboratory Hours</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BIOL 75303*</td>
<td>Molecular Basis of Development: Lecture</td>
<td>30 or 45 hours</td>
<td></td>
<td>2 or 3</td>
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<tr>
<td>BIOL 75304*</td>
<td>Molecular Basis of Development: Laboratory</td>
<td></td>
<td>90 hours</td>
<td>3</td>
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<tr>
<td>BIOL 76300*</td>
<td>Experimental Parasitology: Lecture</td>
<td>45 hours</td>
<td></td>
<td>3</td>
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<tr>
<td>BIOL 76301*</td>
<td>Experimental Parasitology: Laboratory</td>
<td></td>
<td>90 hours</td>
<td>3</td>
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<tr>
<td>BIOL 77003</td>
<td>Cytology: Lecture</td>
<td>30 or 45 hours</td>
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<tr>
<td>BIOL 77004*</td>
<td>Cytology: Laboratory</td>
<td></td>
<td>60 or 90 hours</td>
<td>2 or 3</td>
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<tr>
<td>BIOL 77100*</td>
<td>Problems in Experimental Cytology</td>
<td>30 hours</td>
<td>90 hours</td>
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<tr>
<td>BIOL 77101*</td>
<td>Analysis of Mammalian Cells in Tissue Culture</td>
<td></td>
<td>90 hours</td>
<td>5</td>
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<tr>
<td>BIOL 77301*</td>
<td>Cytogenetics: Lecture</td>
<td>45 hours</td>
<td></td>
<td>3</td>
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<tr>
<td>BIOL 77302*</td>
<td>Cytogenetics: Laboratory</td>
<td></td>
<td>60 hours</td>
<td>2</td>
</tr>
<tr>
<td>BIOL 77400*</td>
<td>Basic Principles of Cellular Microsurgery and Micromanipulation</td>
<td>60 or 90 hours</td>
<td>2 or 3</td>
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<tr>
<td>BIOL 77500</td>
<td>Biotechnology of Algae</td>
<td></td>
<td>30 hours</td>
<td>15 hour discussion, 3</td>
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### Neuroscience

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lecture Hours</th>
<th>Laboratory Hours</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOL 71003*</td>
<td>Cellular Physiology: Lecture</td>
<td>30 or 45 hours</td>
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<td>2 or 3</td>
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<tr>
<td>BIOL 71004*</td>
<td>Cellular Physiology: Laboratory</td>
<td></td>
<td>60 or 90 hours</td>
<td>2 or 3</td>
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<tr>
<td>BIOL 72001*</td>
<td>Animal Physiology: Lecture</td>
<td></td>
<td>45 or 60 hours</td>
<td>3 or 4</td>
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<tr>
<td>BIOL 72002*</td>
<td>Animal Physiology: Laboratory</td>
<td></td>
<td>90 hours</td>
<td>3</td>
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<tr>
<td>BIOL 72101*</td>
<td>Animal Physiology I</td>
<td>60 hours</td>
<td></td>
<td>4</td>
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<tr>
<td>BIOL 72102*</td>
<td>Animal Physiology II</td>
<td>60 hours</td>
<td></td>
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</tr>
<tr>
<td>BIOL 72201*</td>
<td>Endocrinology: Lecture</td>
<td>45 hours</td>
<td></td>
<td>3</td>
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<tr>
<td>BIOL 72202*</td>
<td>Endocrinology: Laboratory</td>
<td></td>
<td>90 hours</td>
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<tr>
<td>BIOL 72301</td>
<td>Neurosciences I: Lecture</td>
<td></td>
<td>45 hours</td>
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<tr>
<td>BIOL 72302</td>
<td>Neurosciences II: Lecture</td>
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<td>45 hours</td>
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<tr>
<td>BIOL 72303*</td>
<td>Neurosciences II: Laboratory</td>
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<td>120 hours</td>
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<td>BIOL 72304</td>
<td>Modules in Neuroscience</td>
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<tr>
<td>BIOL 72401*</td>
<td>Comparative Neuroendocrine Mechanisms</td>
<td>45 hours</td>
<td></td>
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<tr>
<td>BIOL 72403</td>
<td>Animal Behavior I: Lecture</td>
<td>45 hours</td>
<td></td>
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<tr>
<td>BIOL 72404*</td>
<td>Biological Basis of Animal Behavior: Laboratory</td>
<td></td>
<td>90 hours</td>
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BIOL 72405* Current Issues in Behavioral Ontogeny
45 hours lecture, 3 credits
BIOL 72406* Behavior and Evolution
45 hours lecture, 3 credits
BIOL 72407 Animal Behavior II
45 hours, 3 credits
BIOL 72503* Sensory Physiology: Lecture
45 hours lecture, 3 credits
BIOL 72504* Sensory Physiology: Laboratory
90 hours laboratory, 3 credits
BIOL 72505* Animal Communication: Lecture
45 hours lecture, 3 credits
BIOL 72603 Comparative Animal Physiology: Lecture
30 or 45 hours lecture, 2 or 3 credits
BIOL 72604 Comparative Animal Physiology: Laboratory
60 or 90 hours laboratory, 2 or 3 credits
BIOL 72605 Human Neuroanatomy Laboratory
4 hours, 3 credits
BIOL 72703* Endocrine Cytology: Lecture
45 hours lecture, 3 credits
BIOL 72704* Endocrine Cytology: Laboratory
60 hours laboratory, 2 credits
BIOL 72800* Field Studies in Animal Behavior
90 hours fieldwork and conferences, 3 credits
BIOL 72901* Trends and Issues in Physiology/Neuroscience I
3 hours lecture during the Fall, alternate weeks for 1 credit by two or three doctoral faculty at the Graduate Center
BIOL 72902* Trends and Issues in Physiology/Neuroscience II
3 hours lecture during the Spring, alternate weeks for 1 credit by two or three doctoral faculty at the Graduate Center

Plant Sciences
BIOL 70601* Plant Systematics: Lecture
30 hours lecture, 2 credits
BIOL 70602* Plant Systematics: Laboratory
60 hours laboratory, 2 credits
BIOL 70605 Taxonomy of Vascular Plants: Lecture
45 hours lecture, 3 credits
BIOL 70606 Taxonomy of Vascular Plants: Laboratory
60 hours laboratory, 2 credits
BIOL 73001 Plant Physiology: Lecture
30 or 45 hours lecture, 2 or 3 credits
BIOL 73002 Plant Physiology: Laboratory
60 or 90 hours laboratory, 2 or 3 credits
BIOL 74501 Phytochemistry: Lecture
30 hours lecture, 2 credits
BIOL 74502 Phytochemistry: Laboratory
90 hours laboratory, 3 credits
BIOL 75200 Plant Morphogenesis: Lecture
45 hours lecture, 3 credits
BIOL 75201 Plant Morphogenesis: Laboratory
90 hours laboratory, 3 credits
BIOL 75301 Computational Molecular Biology: Lecture and Laboratory
60 hours, 3 credits
Prerequisites or corequisite: BIOL 71013 or instructor permission
BIOL 75401 Comparative Morphology of Vascular Plants: Lecture
30 hours lecture, 2 credits
BIOL 75402 Comparative Morphology of Vascular Plants: Laboratory
90 hours laboratory, 3 credits
BIOL 76403* Plant Ecology: Lecture
45 hours lecture, 3 credits
BIOL 76404* Plant Ecology: Laboratory
90 hours laboratory, 3 credits
BIOL 76405* Economic Botany
30 hours lecture, 30 hours laboratory, 3 credits
BIOL 76501* Paleobotany: Lecture
30 hours lecture, 2 credits
BIOL 76502* Paleobotany: Laboratory
60 hours laboratory, 2 credits

Seminars: General and Special Topics
BIOL 79001 Seminar in Evolution
30 hours plus conferences, 3 credits each semester
BIOL 79002* Seminar in Genetics
30 hours plus conferences, 3 credits each semester
BIOL 79003* Seminar in Behavioral Genetics
30 hours plus conferences, 3 credits each semester
BIOL 79004* Seminar in Molecular Genetics
30 hours plus conferences, 3 credits each semester
BIOL 79005 Seminar in Developmental Biology
30 hours plus conferences, 3 credits each semester
BIOL 79006 Seminar in Ecology
30 hours plus conferences, 3 credits each semester
BIOL 79007* Seminar in Cytology
45 hours, 3 credits each semester
BIOL 79008* Seminar in Biomathematics
30 hours plus conferences, 3 credits each semester
BIOL 79009* Seminar in Biophysics
30 hours plus conferences, 3 credits each semester
BIOL 79010* Seminar in Biochemistry
30 hours plus conferences, 3 credits each semester
BIOL 79011* Seminar in Systematics
45 hours, 3 credits each semester
BIOL 79012* Seminar in Zoogeography
45 hours, 3 credits each semester
BIOL 79021 Seminar in Physiology
45 hours, 3 credits each semester
BIOL 79022* Seminar in Animal Behavior
30 hours plus conferences, 3 credits each semester
BIOL 79023* Seminar in Cell Biology
30 hours plus conferences, 3 credits each semester
BIOL 79063* Seminar in Biological Oceanography
30 hours plus conferences, 3 credits each semester
BIOL 79064 Seminar in Behavioral Aspects of Ecology
30 hours plus conferences, 3 credits each semester
BIOL 79065* Seminar in Tropical Forest Ecology and Conservation
45 hours, 3 credits
BIOL 79091* Selected Topics in Animal Behavior - Biopsychology
15 hours, 1 credit
BIOL 79093* Seminar in Acoustic Communication in Animals
30 hours plus conferences, 3 credits each semester
BIOL 79301, 79302, 79303, 79304 Seminar in Special Topics
15, 30, 45 or 60 hours, 1, 2, 3 or 4 credits each semester

BIOL 79401* Experimental Biology: Lecture
30 or 45 hours, 2 or 3 credits each semester

BIOL 79402* Experimental Biology: Laboratory
60 or 90 hours laboratory, 2 or 3 credits each semester

BIOL 79500* Basic Laboratory Techniques for Research
15 hours lecture, 60 hours laboratory, 3 credits each semester

BIOL 79501 Laboratory in Biotechnology
45 hours, 3 credits

**General**

BIOL 79100 Colloquium
15 or 30 hours each semester, 1/2 or 1 credit each semester

BIOL 89800 Advanced Study
1-10 credits each semester

BIOL 89900 Independent Doctoral Research
Credit to be assigned, up to a maximum of 10 credits. Required of all candidates for the doctorate.

BIOL 90000 Dissertation Supervision
1 credit

*offered infrequently