

Biology

REQUIREMENTS FOR A BIOLOGY MAJOR

The biological sciences are a diverse collection of scientific disciplines that interact and intermingle in tremendously complex and interesting ways. To provide the maximum potential for students to explore this vast area of science, the Department of Biological Sciences offers a flexible major that allows students to shape coursework in their plan of study to their individual interests and career aspirations. Before declaring a major, students develop their course plan in consultation with one or more faculty mentors.

Prerequisites: BIOL 11: The Science of Life, CHEM 5 and 6, and one course from among COSC 5, MATH 4 or above, ENGS 10, or BIOL 29. A student who elects to include BIOL 29 in their area of concentration (see below) must fulfill this prerequisite with one of the other courses (i.e., COSC 5, MATH 4, or ENGS 10). Although not required for the major, some upper-level Biology courses require CHEM 51-52. In addition, many graduate and professional schools require CHEM 51-52 for admission, and so we highly recommend that students consider taking these courses.

Foundation Courses: After completing BIOL 11, students take three courses from among five foundation courses: BIOL 12 (Cell Structure and Function); BIOL 13 (Gene Expression and Inheritance); BIOL 14 (Physiology); BIOL 15 (Microevolution); BIOL 16 (Ecology). In deciding which three courses to select from this list, students should discuss with their faculty mentors which foundation courses would be most appropriate for their area of concentration. Not all foundation courses need to be completed before the student moves on to courses in their area of concentration.

Area of Concentration: To complete the major, students focus in an area of concentration by taking six other courses. Below we list a number of possible areas of concentration that students may find useful in guiding their course selection. Under each area, we list a number of appropriate courses from which these six courses could be selected. These are only meant as suggestions to initiate the formulation of an area of concentration. Many other areas are possible, and the major is designed to provide maximum flexibility for students to tailor their programs to their individual interests and career aspirations. Each student will develop their major in consultation with one or more faculty mentors who share interests with the student's area of concentration. Faculty members with interests in the listed areas are given below; students interested in other areas should ask the Department Chair to suggest which faculty member would be most appropriate to mentor the student in developing their course plan. Up to two suitable advanced courses from other departments may be included in the area of concentration when appropriate to the student's objectives, or a modified major can be constructed (see below). One term of Independent Research (BIOL 95) or Honor's Research (BIOL 97) may also be included among the six courses.

Some examples of courses that would contribute to various Areas of Concentration (possible faculty mentors are listed in parentheses):

BEHAVIOR AND NEUROBIOLOGY (Calsbeek, Irwin, McPeck, Velez, Witters): BIOL 27 34, 37, 52, 74, 79, PSYC 26, 65

BIOCHEMISTRY (Bickel, Dolph, Gladfelter, Schaller, Sloboda, Smith, Witters): BIOL 37, 40*, 44, 45, 46, 47, 66, 69, 71, 78, CHEM 52/58, 61, 63, 67

CELL BIOLOGY (Bickel, Gladfelter, Schaller, Sloboda, Smith, Witters): BIOL 34, 37, 38, 40*, 42, 43, 44, 45, 46, 66, 67, 69, 71,78, CHEM 41, 52/58, 63, 67

DEVELOPMENT (Berger, Erives, Jack, Lambie, Peterson): BIOL 24, 28, 36, 38, 40*, 43, 44, 45, 53, 54, 62, 63, 75, 76

ECOLOGY (Ayres, Cottingham, Folt, Irwin, McPeck, Peart): BIOL 20, 21 or 51, 22, 23, 25, 26, 27, 28, 29, 31, 50, 52, 55, 56, 57, 58, 59, 60, CHEM 52/58, ENVS 79, 80, 89

EVOLUTIONARY ECOLOGY (Calsbeek, Irwin, McPeck): BIOL 20, 21 or 51, 27, 28, 31, 38, 45, 47, 50, 52, 58, 59

GENETICS (Berger, Bickel, Dolph, Guerinot, Jack, Lambie, McClung): BIOL 36, 38, 45, 47, 53, 61, 63, 65, 66, 71, 75, 76, 79

GENOMICS, BIOINFORMATICS AND COMPUTATIONAL BIOLOGY (Cottingham, Erives, Gross, McPeck): BIOL 28, 29, 36, 39, 45, 47, 53, 59, 62, 75, and appropriate COSC, MATH and ENGS courses

HUMAN BIOLOGY (Dolph, Smith, Velez, Witters): BIOL 24, 34, 35, 36, 37,40*, 42, 44, 45, 46, 47, 66, 67, 69, 71, 78, 79, CHEM 52/58

MOLECULAR ECOLOGY (Calsbeek, McPeck): BIOL 21 or 51, 31, 36, 40*, 45, 47, 50, 53, 58

MOLECULAR EVOLUTION (Dietrich, Erives, McPeck, Peterson): BIOL 28, 36, 38, 39, 40*, 45, 47, 53, 62, 75

MOLECULAR GENETICS (Berger, Bickel, Dolph, Erives, Guerinot, Jack, Lambie, McClung): BIOL 38, 45, 47, 53, 61, 65, 66, 69, 71,75,79, CHEM 52/58

PALEOBIOLOGY (Peterson): BIOL 20, 24, 28, 53, 60, 62, EARS 31, 34, 45-47,68,72

PHYSIOLOGY AND ORGANISMAL BIOLOGY (Ayres, Calsbeek, McPeck, Velez, Witters): BIOL 24, 31, 34, 35, 37, 42, 43, 44, 54, 78, 79, CHEM 52/58

PLANT BIOLOGY (Ayres, Guerinot, Irwin, Jack, McClung, Peart, Schaller): Biol 21 or 51, 22, 26, 31, 41, 54, 55, 57, 58 CHEM 52/58

PLANT MOLECULAR BIOLOGY (Guerinot, Jack, McClung, Schaller): BIOL 36, 38, 39, 41, 45, 54, 63, 75, CHEM 52/58

*Note that BIOL 40 requires Chem 51-52/57-58 as a prerequisite.

Culminating Experience:

One course among the six in the area of concentration must satisfy the culminating experience requirement. Any Biology course numbered 50 or above that is appropriate for the student's Area of Concentration will satisfy the culminating experience requirement. Each student will determine with their faculty mentor which course is suitable as a culminating experience for their Area of Concentration and interests. These courses include courses in the foreign study program, independent research courses, courses that focus on the primary literature in a discipline, and courses with substantial laboratory components and/or individual projects. The culminating experience course should be taken in a student's senior year, although a course taken in the

junior year may in exceptional circumstances satisfy the culminating experience and requires the approval of the Department Chair.

REQUIREMENTS OF A BIOLOGY MODIFIED MAJOR

For a modified major, the area of concentration consists of four Biology courses and four suitable advanced courses from another department or combination of departments. Prerequisite and foundation course requirements remain the same.

REQUIREMENTS OF THE BIOLOGY MINOR

A Biology Minor consists of completing BIOL 11, two foundation courses, and three courses in the student's area of concentration.

ACADEMIC STANDING

Satisfactory completion of the Biology major or modified major requires obtaining a final grade point average of at least 2.00 in BIOL 11 and all foundation and area of concentration courses applied to the major. No more than two transfer credits may be used for foundation and area of concentration courses.

CREDIT AND ADVANCED PLACEMENT

Starting with the class of 2009, the Department will give one unspecified credit for a biology course to students who receive a score of 5 on the CEEB Advanced Placement Test or a score of 6 or 7 on the Higher Level International Baccalaureate (IB) exam. This unspecified credit satisfies no prerequisite or major course requirements and allows no placement into advanced courses. Under exceptional circumstances, students (including those with IB credit) may request permission in writing, supplying suitable evidence of their preparation for placement into advanced courses, before the end of the fall term. Students who seek such credit should consult the faculty of the course in question *and* the chair of the departmental Undergraduate Committee. *Except under exceptional circumstances, the Department gives no credit for courses taken at another college or university prior to matriculation at Dartmouth.*

INDEPENDENT RESEARCH AND THE BIOLOGY HONORS PROGRAM

Biology majors are encouraged undertake independent research in biology either as part of the Honors Program or separately. Participants in the Honors Program should enroll in Biology 97. The subject of the honors research project must be directly relevant to the student's area of concentration. Those who conduct research outside of the Honors Program should enroll in Biology 95.

Work on an Honors thesis normally extends through three terms. Candidates for Honors must meet the minimum College requirements. *Application for the Program should be made no later than two weeks after the start of classes three terms before graduation.* Plans for research should be made in the term before the project begins. Independent research conducted off campus during a leave/transfer term without the direct supervision of a faculty advisor from the Dartmouth College Department of Biological Sciences cannot be used to earn credit for Biology 95, 96, or 97.

During the first term of Honors work the candidate shall work individually, on a trial basis, with a faculty supervisor. Biology 97 (or 95) may be counted only once among the six courses for the area of concentration, but two terms of Biology 95, 96, or 97 may be taken for course credit towards graduation.

Each Honors candidate shall submit a thesis to a committee composed of three faculty members, including the thesis supervisor, at least two weeks before the end of the last term. At least two members of this committee must be members of the Biology faculty. Each candidate's Honors Program concludes with the candidate making a public presentation of her or his work, followed by an oral examination, conducted by the thesis committee, on the thesis work and related topics. The quality of the written thesis and the student's grasp of his or her research program as determined by their performance on the oral exam determines if the student's degree is awarded with honors.

REQUIREMENTS FOR ADVANCED DEGREES

The general requirements for advanced degrees are given in the Regulations for Graduate Study section. Each graduate student must receive credit for a set of courses chosen in consultation with the advisory committee. All graduate students are expected to participate in departmental colloquia and weekly seminars.

To receive the Ph.D. degree in Biology a candidate must satisfactorily:

1. Complete the course requirement, as described above.
2. Complete the teaching requirement as specified by the advisory committee.
3. Demonstrate mastery of conceptual and factual material in the major area of specialization in an oral examination.
4. Present and satisfactorily defend a thesis proposal before the advisory committee.
5. Satisfy the two-year residence requirement of the College.
6. Complete a doctoral dissertation.
7. Defend the dissertation before a faculty committee appointed for this purpose.

Although the graduate program is designed for students pursuing the Ph.D. degree, a master's degree may be awarded under special circumstances. To receive an M.S. degree in Biology, a candidate 1) must satisfactorily complete course and teaching requirements, as specified by the advisory committee, 2) complete a thesis, 3) defend the thesis in an oral examination before a faculty committee, and 4) satisfy the one-year residence requirement of the College.