

BIOLOGY

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Yale offers four biological science majors: Ecology and Evolutionary Biology (E&EB); Molecular Biophysics and Biochemistry (MB&B); Molecular, Cellular, and Developmental Biology (MCDB); and Neuroscience (NSCI). The distinctions between these majors reflect the types of biological systems analysis each represents: the analysis of whole organisms, populations, and ecosystems (E&EB); the analysis of life at the molecular level using tools of chemistry and physics (MB&B); the analysis of molecular, cellular, and developmental biology, genetics, neurobiology, and quantitative biology (MCDB); and the analysis of neurons, neural circuits, brains, and behavior, using a wide range of approaches (NSCI). Yale also offers the Biomedical Engineering (BENG) major for students interested in studying biological systems from the perspectives of the physical sciences and engineering.

Together, these approaches cover the vast breadth of disciplines in the biological sciences. The courses BIOL 101–104 are designed as entry points to all four programs. The prerequisites for the four majors are similar, so students need not commit to a specific major in their first year. Students who wish to major in any of the four tracks (E&EB, MB&B, MCDB, and NSCI) must complete all four modules.

For information on the major requirements, course offerings, and departmental faculty of the biological sciences programs, see Ecology and Evolutionary Biology; Molecular Biophysics and Biochemistry; Molecular, Cellular, and Developmental Biology; and Neuroscience. See also information for Biomechanical Engineering.

The BIOL 101–104 modules are each half-semester, half-credit courses that together make up a yearlong course known as the biology sequence. The aim of the sequence is to provide students with a foundation in the biological sciences. Prospective majors in Molecular Biology and Biophysics (MB&B), Molecular, Cellular, and Developmental Biology (MCDB), Ecology and Evolutionary Biology (E&EB), and Neuroscience (NSCI) and other students wishing to learn about the biological sciences should **complete the entire** BIOL 101–104 sequence. Majors in Biomedical Engineering (BENG) are only required to take BIOL 101 and 102.

The foundational biology sequence is offered jointly by the departments of Molecular Biophysics and Biochemistry; Molecular, Cellular, and Developmental Biology; and Ecology and Evolutionary Biology. The four modules that comprise the biology sequence are:

- BIOL 101, Biochemistry and Biophysics
- BIOL 102, Principles of Cell Biology
- BIOL 103, Genetics and Development
- BIOL 104, Principles of Ecology and Evolutionary Biology

All modules are offered during both the fall and spring terms. BIOL 101 and BIOL 103 are offered during the *first half* of both the fall and spring terms. BIOL 102 and BIOL 104 are offered during the *second half* of both the fall and spring terms.

Since **the modules must be taken in order**, students typically start by taking BIOL 101 and BIOL 102 in the fall or spring term and complete the sequence by taking BIOL 103 and BIOL 104 in the following term. To unify the modules, course coordinators travel with a single cohort of students as they progress through the foundational biology sequence. Thus, please direct all inquiries related to the foundational biology sequence course to Leah Hartmann. (amaleah.hartman@yale.edu)

Take note that each module is taught as *its own* course, so students must register for each module *separately*. Students receive a *separate* grade for each module. The modules must be taken in sequence. This means that you must successfully pass or place out of BIOL 101 to be eligible to take BIOL 102 and so forth.

Students with advanced preparation may be eligible to place out of one or more of these courses; see the Yale College Dean's Office website: Placement, Exams, and Information: Biology for details. See also this website with frequent Q&A's on the placement exam.

MAJORS IN THE BIOLOGICAL SCIENCES AND BIOMEDICAL ENGINEERING

Yale offers four undergraduate majors in the biological sciences and a major in Biomedical Engineering (BENG). The biological sciences majors are Ecology and Evolutionary Biology (E&EB); Molecular Biophysics and Biochemistry (MB&B); Molecular, Cellular, and Developmental Biology (MCDB); and Neuroscience (NSCI). The distinctions between these majors reflect the types of biological systems analysis each represents: the analysis of whole organisms, populations, and ecosystems (E&EB); the analysis of life at the molecular level using tools of chemistry and physics (MB&B); the analysis of molecular, cellular, and developmental biology, genetics, neurobiology, and quantitative biology (MCDB); and the analysis of neurons, neural circuits, brains, and behavior, using a wide range of approaches (NSCI). Together, these approaches cover the vast breadth of disciplines in the biological sciences.

The foundational coursework applicable to the four majors is similar, so students need not commit to a specific major during their first year. Most prospective majors begin study as first-year students in at least two subjects from among the basic science prerequisites of chemistry, biology, and mathematics. The specific combination and sequence of courses that best serve a given student's needs depend on factors such as advanced placement and the student's other academic and extracurricular commitments. It is therefore critically important for students to seek individualized advice from one of the directors of undergraduate studies (DUSes) or other departmental representatives before selecting first-year science courses.

The Biomedical Engineering major is available for students interested in studying biological systems from the perspectives of the physical sciences and engineering. As in the other biological sciences majors, students need not commit in their first year, but should in most cases begin their preparation by taking courses in mathematics and in

at least one of the basic sciences of biology, chemistry, or physics. The appropriate level and combination of courses depends on each student's preparation and interests, and students are urged to seek individualized advice before selecting fall-term courses.

See each program's individual entry for more information.

[View Courses](#)

Courses

BIOL 101a or b, Biochemistry and Biophysics Staff

The study of life at the molecular level. Topics include the three-dimensional structures and function of large biological molecules, the human genome, and the design of antiviral drugs to treat HIV/AIDS. The first of four modules in a yearlong foundational biology sequence; meets for the first half of the term. SC o Course cr

BIOL 102a or b, Principles of Cell Biology Staff

The study of cell biology and membrane physiology. Topics include organization and functional properties of biological membranes, membrane physiology and signaling, rough endoplasmic reticulum and synthesis of membrane/secretory membrane proteins, endocytosis, the cytoskeleton, and cell division. The second of four modules in a yearlong foundational biology sequence; meets for the second half of the term.

Prerequisite: BIOL 101. SC o Course cr

* **BIOL 103a or b, Genetics and Development** Staff

Foundation principles for the study of genetics and developmental biology. How genes control development and disease; Mendel's rules; examples of organ physiology. The third of four modules in a yearlong foundational biology sequence; meets for the first half of the term. Prerequisites: BIOL 101 and 102. SC o Course cr

BIOL 104a or b, Principles of Ecology and Evolutionary Biology Staff

The study of evolutionary biology, animal behavior, and the history of life. Evolutionary transitions and natural selection. Adaptation at genic, chromosomal, cellular, organismal, and supra-organismal levels. Distributional and social consequences of particular suites of organismal adaptations. The fourth of four modules in a yearlong foundational biology sequence; meets for the second half of the term. Prerequisites: BIOL 101, 102, and 103. SC o Course cr