
BIOLOGICAL SCIENCES

FACULTY

Chairperson: Professor Kevin Curry

Graduate Program

Coordinator: Professor John Jahoda

Professor: Hardy Moore

Associate

Professors: Jeffery Bowen, Michael Carson,
Patricia Mancini, Donald Padgett

Assistant

Professors: Christopher Bloch, Merideth Krevosky,
Michelle LaBonte

Department Telephone Number: 508.531.1358

Location: Conant Science Building, Room 226A

Web site: www.bridgew.edu/Biology

DEGREE PROGRAMS

- BS in Biology
Concentrations: Environmental Biology,
Biomedical/Molecular Biology (Biomedical Area,
Molecular Area), General Biology (Standard
Program, Teacher Preparation Program)
- BA in Biology
- MAT - Biology
- MAT - General Science

UNDERGRADUATE MINOR

- Biology
- Biotechnology
- Environmental Biology

The department offers an undergraduate program leading to the degree of Bachelor of Science or Bachelor of Arts and a graduate program leading to the degree of Master of Arts in Teaching. The goal of the undergraduate program is to provide students with broad backgrounds allowing for flexibility in making career choices. Students enrolled in the graduate program have the opportunity to develop their skills and knowledge in more specialized areas.

The Bachelor of Science program is designed to provide the skills and knowledge necessary for employment in the biotechnology, environmental, health-related, and teaching areas, as well as providing a sound foundation

for graduate or professional school. The Bachelor of Arts permits the student to explore personal interests in biology while developing the background needed to use biological knowledge in association with a field such as sales, illustration, or elementary education. With careful course selection, this degree can prepare the student for the opportunities listed above for the Bachelor of Science.

In addition to the broad array of biology courses, students have opportunities to join biology faculty in research projects, and to participate in internships, whether local, regional or out-of-state.

The Department of Biological Sciences is located in the Conant Science Building. The department has 10 teaching laboratories, two lecture rooms, a faculty research area, a biology museum-seminar room, a bioassay laboratory, an electron microscope laboratory and the South Shore Herbarium. The laboratories are well equipped to help students apply the theoretical principles of their courses. Equipment includes not only light microscopes but also two electron microscopes; there are microtomes, a liquid scintillation counter, electrophoretic equipment, spectrophotometers and electrophysiological recording instruments. In addition, there is close cooperation between the biology and chemistry departments, so that other equipment may be shared.

Located on the three acres next to the building are a 20 x 80 foot greenhouse and the biology garden including a pond for aquatic plants. The greenhouse and gardens support laboratory and field work and are planted with specimens of horticultural interest.

The location of the campus is a major advantage for conducting field work and ecological studies. Within an hour's drive of the campus are such diverse habitats as bays, salt-marshes, sandy beaches, rocky shores, estuaries, bogs, freshwater ponds, streams and rivers (clean and polluted), white cedar swamps, marshes, pine groves and hemlock groves.

The department maintains and operates the Watershed Access Laboratory located in the John Joseph Moakley Center for Technological Applications. This laboratory is designed for use in teacher professional development in environmental education and for interdisciplinary watershed studies.

UNDERGRADUATE PROGRAMS

The two versions of the biology major are the Bachelor of Science in Biology (BS) and the Bachelor of Arts in Biology (BA). Each student majoring in biology will be assigned a departmental academic adviser from among the faculty of the department, and should consult with the adviser in regard to both the BS versus BA decision, and selection of courses. It is also important to frequently meet with the adviser to verify progress toward completion of graduation requirements.

BACHELOR OF SCIENCE IN BIOLOGY (BS)

The department offers a BS degree program with three concentrations: environmental biology, biomedical/molecular biology and general biology. Within the biomedical/molecular concentration, a student focuses on either the biomedical area or the molecular area. Within the general concentration, a student focuses on the standard program or the high school/middle school teacher preparation program. All BS students are required to take a core of courses consisting of General Biology I and II, Cell Biology, Ecology, Genetics and Microbiology. In consultation with the departmental adviser, each student selects additional courses that satisfy the requirements of his or her particular concentration. The Bachelor of Science is designed to prepare the student for employment as a biologist in a laboratory or field setting, or for advanced training at a graduate or professional institution.

The **Environmental Biology** concentration presents course work in such areas as wetlands biology, biomonitoring, freshwater ecology and marine mammal biology. This program encourages students to use their electives to develop a diversified background of skills in earth science, geography and chemistry to complement their environmental interest and open future opportunities for internships and careers. Cooperative programs with community environmental monitoring organizations such as the Taunton River Watershed Alliance allow students to gain practical experience while investigating actual environmental problems.

The **Biomedical/Molecular Biology** concentration offers course work in such fields as histology, immunology, virology, embryology, biochemistry, molecular biology and electron microscopy. The two areas within this concentration are distinguished by their physiology courses: the biomedical area includes courses in Human Anatomy and Physiology, while the molecular area offers the option of Animal Physiology or Plant Physiology or Human Anatomy and Physiology. The biomedical area prepares students for health-related pursuits such as laboratory or clinical work, or health-professional

schools. The molecular area is designed for students who plan on graduate study in cellular or molecular biology, and for those who seek a career in molecular biology or biotechnology laboratory work or research. Biomedical/Molecular Internship opportunities are available in local hospitals and research laboratories as well as national agencies.

The **General Biology** concentration is a broad program of biological study without defined specialization. The standard program provides a wide-ranging background together with courses that are tailored to the student's individual interests. The high school/middle school teacher preparation program is designed to provide the breadth of knowledge required for earning Massachusetts teacher licensure and helping middle and high school pupils meet Massachusetts educational standards. Internship opportunities for the standard program include local hospitals and research laboratories; environmental monitoring agencies, biological firms and organizations; and national agencies.

BACHELOR OF SCIENCE IN BIOLOGY

(All BS students must take the core and cognate courses.)

Core Courses

BIOL 121-122 General Biology I-II
 BIOL 200 Cell Biology
 BIOL 225 Ecology
 BIOL 321 Genetics
 BIOL 428 Microbiology

Cognate Courses:

CHEM 141-142 Chemical Principles I-II
 CHEM 343-344 Organic Chemistry I-II
 MATH 141 Elements of Calculus I
 or
 MATH 151 Calculus I*
 MATH 142 Elements of Calculus II*
 or
 MATH 152 Calculus II*
 or
 A course in applied statistics (e.g. MATH 110)
 PHYS 181 Elements of Physics I
 or
 PHYS 243 General Physics I*
 PHYS 182 Elements of Physics II
 or
 PHYS 244 General Physics II*

* Pre-medical, pre-veterinary and pre-dental students: PHYS 243-244 is required. MATH 151 is preferred. A second semester of calculus should be taken.

Note: A student may not apply both BIOL 373 and BIOL 251-252 toward the BS degree in Biology. BIOL 280 may not be applied toward the BS degree in Biology.

ENVIRONMENTAL BIOLOGY CONCENTRATION

Biology core and cognate courses in addition to the following:

BIOL 341 Plant Physiology

Select four environmental biology concentration elective courses (consult “A” below). At least two of the four courses must be courses other than BIOL 485, BIOL 497, BIOL 498, or BIOL 499.

One environmental concentration elective course in another discipline is recommended (consult “B” below.)

Environmental Biology Concentration Internship/Research

Biology majors in the environmental biology concentration should strive to qualify for a 3 credit internship or research experience (BIOL 498 Internship in Biology, or BIOL 497 Undergraduate Biological Research) as part of their concentration electives. Some examples are volunteer experience through the Student/Conservation Association, paid internships with regulatory agencies such as the Massachusetts Department of Environmental Protection or the National Park Services, or research with professional investigators at Bridgewater State College. (An expanded list of internship opportunities may be accessed at the biology department Web site. Also consult the biology internship section which follows.)

A. Environmental Biology Concentration Electives (four courses from the following list):

BIOL 243 Systematic Botany
 BIOL 284 Invertebrate Zoology
 BIOL 325 Ichthyology
 BIOL 326 Marine Biology
 BIOL 327 Wetlands Biology
 BIOL 372 Animal Behavior
 BIOL 373 Animal Physiology
 BIOL 408 The Biology of Marine Mammals
 BIOL 420 Limnology
 BIOL 422 Biological Evolution
 BIOL 423 Biological Invasions
 BIOL 425 Population Ecology
 BIOL 426 Biomonitoring
 BIOL 485 Honors Thesis
 BIOL 490 Special Topics in Biology (at least 3 credits)
 BIOL 497 Undergraduate Biological Research
 BIOL 498 Internship in Biology (3 credit limit)

BIOL 499 Directed Study in Biology (3 credits)

B. Environmental Biology Concentration Electives (one course recommended from the following list):

CHEM 100 Computers in Chemistry
 CHEM 250 Instrumentation
 COMP 105 Computers and Their Applications: An Introduction
 EASC 210 Physical Oceanography
 EASC 240 Hydrology
 EASC 306 Biological Oceanography
 EASC 317 Remote Sensing of the Environment
 GEOG 213 Geographic Information Systems
 GEOG 317 Air-Photo Interpretation/Remote Sensing
 INTD 350 Soil Identification and Interpretation for Land Use

Core Curriculum Requirements

A minimum of 120 earned hours is required for graduation. These earned hours include Core Curriculum Requirements as specified in the “Undergraduate Academic Programs” section of this catalog. For additional graduation requirements, see the “Undergraduate Academic Policies” section of this catalog.

BIOMEDICAL/MOLECULAR BIOLOGY CONCENTRATION

Biomedical/Molecular Concentration:

Biomedical Area

Biology core/and cognate courses in addition to the following:

BIOL 251-252 Human Anatomy and Physiology I-II

Two Biomedical/Molecular Concentration Electives (consult “A” below)

Select one additional biology elective of any type at or above the 300 level (3 or 4 credits) (see the “Course Descriptions” section in this catalog for all additional 300-400 level courses).

At least two of the three elective courses must be courses other than BIOL 485, BIOL 497, BIOL 498 or BIOL 499.

Biomedical/Molecular Biology Concentration:

Molecular Area

Biology core/and cognate courses in addition to the following:

- BIOL 341 Plant Physiology
or
BIOL 373 Animal Physiology
or
BIOL 251–252 Human Anatomy and Physiology I–II

Select three biomedical/molecular concentration electives (consult “A” below). At least two of the three courses must be courses other than BIOL 485, BIOL 497, BIOL 498, or BIOL 499.

Select one additional biology elective of any type at or above the 300 level (3 or 4 credits) (see the “Course Descriptions” section in this catalog for all additional 300–400 level courses).

A. Biomedical/Molecular Biology Concentration Electives:

- BIOL 284 Invertebrate Zoology
- BIOL 320 Biochemistry
- BIOL 350 Molecular Biology
- BIOL 371 Histology
- BIOL 375 Immunology
- BIOL 376 General Endocrinology
- BIOL 382 Comparative Chordate Anatomy
- BIOL 430 Embryology
- BIOL 434 Biological Electron Microscopy
- BIOL 436 Mammalian Reproductive Physiology
- BIOL 450 Virology
- BIOL 472 Human Genetics
- BIOL 475 Parasitology
- BIOL 482 Neurobiology
- BIOL 485 Honors Thesis
- BIOL 490 Special Topics in Biology (at least 3 credits)
- BIOL 497 Undergraduate Biological Research
- BIOL 498 Internship in Biology (3 credit limit)
- BIOL 499 Directed Study in Biology (3 credits)

Core Curriculum Requirements

A minimum of 120 earned hours is required for graduation. These earned hours include Core Curriculum Requirements as specified in the “Undergraduate Academic Programs” section of this catalog. For additional graduation requirements, see the “Undergraduate Academic Policies” section of this catalog.

Biomedical/Molecular Biology Concentration Internship/Research

Biology majors in the biomedical/molecular concentration should strive to qualify for a 3 credit internship or research experience (BIOL 498 Internship in Biology, or BIOL 497 Undergraduate Biological Research) as part of their concentration electives. Some examples are

volunteer or paid experiences in a nearby laboratory or clinic; internships with agencies such as The National Institutes of Health, Jackson Laboratory or The Washington Center; or research with professional investigators at Bridgewater State College. (An expanded list of internship opportunities may be accessed at the biology department Web site. Also consult the biology internship section which follows.)

GENERAL BIOLOGY CONCENTRATION

General Biology Concentration: Standard Program

Biology core and cognate courses in addition to the following:

- BIOL 341 Plant Physiology
- BIOL 373 Animal Physiology

Three courses at or above the 200 level for a total of at least nine credits. (See the “Course Description” section in this catalog for all 200–400 level courses.) At least two of the three courses must be courses other than BIOL 485, BIOL 497, BIOL 498, or BIOL 499.

Core Curriculum Requirements

A minimum of 120 earned hours is required for graduation. These earned hours include Core Curriculum Requirements as specified in the “Undergraduate Academic Programs” section of this catalog. For additional graduation requirements, see the “Undergraduate Academic Policies” section of this catalog.

General Biology Concentration: High School/Middle School Teacher Preparation Program

Students preparing to teach in high school or middle school must complete this BS degree in biology and minor either in secondary education–high school (grades 8–12) or secondary education–middle school (grades 5–8). Successful completion of either of these programs will lead to Massachusetts Initial Teacher Licensure. Please refer to the catalog entry for the “Department of Secondary Education and Professional Programs” for specific teacher licensure and program requirements.

Biology core and cognate courses in addition to the following:

- BIOL 251–252 Human Anatomy and Physiology I–II
- BIOL 341 Plant Physiology
- BIOL 422 Biological Evolution
- or
- BIOL 118 Evolution

BIOL 382 Comparative Chordate Anatomy
or
BIOL 284 Invertebrate Zoology
EASC 100 Physical Geology

The following course is recommended:

BIOL 490 Special Topics in Biology: Bioethics
or
PHIL 215 Environmental Ethics
or
PHIL 216 Values and Technology
or
PHIL 105 Reasoning and Science

Biology departmental approval to participate in the teaching practicum as signified by the signature of the biology department chairperson on the application to engage in the practicum, is provided if the following criteria are met:

1. Minimum biology GPA of 2.8
2. Any grade of D+ or lower in a biology core course has been repeated for a grade of at least C-
3. Any grade of D+ or lower in a biology elective has been repeated for a grade of at least C-, or substituted with an approved biology elective with a grade of at least C-

Core Curriculum Requirements

A minimum of 120 earned hours is required for graduation. These earned hours include Core Curriculum Requirements as specified in the “Undergraduate Academic Programs” section of this catalog. For additional graduation requirements, see the “Undergraduate Academic Policies” section of this catalog.

BACHELOR OF ARTS IN BIOLOGY (BA)

The BA degree is designed for the biology major who wishes to use biological knowledge in pursuit of a career outside of biology. Examples of such careers are elementary education, science writing, scientific illustration, technical sales, or work for a publishing company. By carefully selecting biology courses and adding particular courses in chemistry, physics and mathematics beyond the BA requirements, a BA degree holder may qualify for many of the career opportunities listed under the BS.

The BA degree requires a minimum of 12 courses with the following specifications:

BIOL 121-122 General Biology I-II
Two biology courses at the 200 level
Two biology courses at the 300 level

Two biology courses at the 400 level
Two additional biology courses at or above the 200 level
CHEM 131-132 Survey of Chemistry I-II

Note: A student may not apply both BIOL 280 and BIOL 251-252 toward the BA degree in Biology.

Core Curriculum Requirements

A minimum of 120 earned hours is required for graduation. These earned hours include Core Curriculum Requirements as specified in the “Undergraduate Academic Programs” section of this catalog. For additional graduation requirements, see the “Undergraduate Academic Policies” section of this catalog.

DOUBLE MAJOR WITH ELEMENTARY AND EARLY CHILDHOOD EDUCATION OR SPECIAL EDUCATION

Students may choose a double major in biology and elementary and early childhood education or special education. Appropriate advising materials are available in the biology department office and the Elementary and Early Childhood Education Office.

BIOLOGY MINOR

A minimum of 18 credits in Biology, including:
BIOL 121 General Biology I

At least 14 additional credits in biology at or above the 200 level planned in consultation with the chairperson of biological sciences.

Note: BIOL 122 General Biology II may be substituted for one of the courses at or above the 200 level.

BIOTECHNOLOGY MINOR

A minimum of 18 credits in biology, including:
BIOL 121 General Biology I (4 credits)
BIOL 200 Cell Biology
BIOL 321 Genetics
BIOL 428 Microbiology

At least 4 additional credits in biology from the biomedical/molecular biology concentration electives planned in consultation with the chairperson of biological sciences.

ENVIRONMENTAL BIOLOGY MINOR

A minimum of 18 credits in biology, including:
BIOL 121 General Biology I
BIOL 122 General Biology II
BIOL 225 Ecology

At least 7 additional credits in biology from the environmental concentration electives planned with the chairperson of biological science.

HONORS PROGRAM

The Departmental Honors Program in Biology provides an opportunity for highly-qualified biology majors to study biology and to conduct independent research in biology for honors credit. Interested students should contact the Department of Biological Sciences by their sophomore year for further information concerning eligibility and application.

UNDERGRADUATE RESEARCH

The Department of Biological Sciences provides the opportunity for students to participate in a true research experience, which is increasingly an advantageous component of undergraduate training.

Each semester, BIOL 396 Research Problems in Biology and BIOL 497 Undergraduate Biological Research are offered by faculty members who direct and supervise either individuals or a small team of undergraduates in a research project. Students are intimately involved with experimental design as well as data collection, analysis and interpretation. The course culminates with a student presentation of the semester's work in a departmental seminar. These courses are often followed by a presentation at a professional scientific meeting. Research topics vary from semester to semester as different faculty members direct the research course; equally valuable training and experience in scientific methodology is obtained with all topics. The Department of Biological Sciences highly recommends this experience which adds a profitable dimension that is not provided by ordinary course work.

BIOLOGY INTERNSHIP

Biology students interested in developing a field or laboratory experience through BIOL 498 Internship in Biology must meet the following criteria to be considered:

1. Prior completion of at least 54 credits and at least two semesters of biology at Bridgewater State College.
2. Minimum 2.5 cumulative GPA overall, and 2.7 GPA in biology.
3. Prior agreement of a faculty member to act as faculty supervisor and oversee the specific internship.
4. Submission of a completed internship application form to the department chairperson by the middle of the semester preceding the internship.

A list of internship opportunities may be accessed at the biology department Web site.

School of Arts and Sciences

GRADUATE PROGRAMS

Graduate Program Coordinator: Dr. John Jahoda

MASTER OF ARTS IN TEACHING BIOLOGY

The Master of Arts in Teaching degree was developed for high school and middle school subject area teachers who have an initial license and are seeking a professional license in the Commonwealth of Massachusetts. The MAT program is designed to meet the "appropriate master's degree" requirement, which is part of the criteria for professional stage licensure, as set forth in the most recent DOE licensure regulations. This degree program will also appeal to secondary school teachers who already hold a standard level of professional license and want to acquire additional knowledge and a master's degree in the discipline.

Students should consult the "School of Graduate Studies" section of the catalog for information regarding graduate program procedures.

Admission Requirements

- 1.) A 2.75 undergraduate GPA based upon four years of work or a 3.0 undergraduate GPA based upon work completed during the junior and senior years.
- 2.) A composite score of 900 on the quantitative and verbal parts of the GRE General Test.
- 3.) An initial teaching license.
- 4.) Three appropriate letters of recommendation.

All accepted students must enroll under the direction of their adviser in GRPP 501 Graduate Program Planning, which is described under "Graduate Advisers and Graduate Program Planning" in the "School of Graduate Studies" section of this catalog.

Program Requirements

Education Core Courses 15 credits

- EDMC 530 The Teacher as Researcher
- EDMC 531 The Standards-Based Classroom: Curriculum
- EDMC 532 The Teacher as Leader: From Issues to Advocacy
- EDMC 533 The Standards-Based Classroom: Instruction and Assessment for Diverse Learners

EDMC 538 The Professional Teacher (final program course)

Concentration Requirements

MAT students are expected to have, or acquire in addition to degree requirements, an appropriate background of college level courses, to be determined by the department.

Biology Courses:

18 credit hours of biology from among the following: (The student may take the same numbered course more than once if the subject matter is different.)

BIOE 511 Advanced Biological Topics and Techniques

BIOE 512 Advances in Biological Science

BIOE 513 Advances in Cell/Molecular Biology

BIOE 514 Advances in Biomedical/Physiological
Biology

BIOE 515 Advances in Ecological/Environmental
Biology

BIOL 503 Directed Study (or other approved course)

BIOE 511 - BIOE 515 will focus on outcomes. Teachers will be expected to develop a knowledge base appropriate to the subject matter and to develop the skills and techniques needed for laboratory or fieldwork in the field study.

Subject matter for BIOE 511 - BIOE 515 will be addressed by the requirements of graduate level companion courses designated by the department. Graduate students enrolled in the BIOE 500 level courses will receive additional assignments and examination questions for evaluation of graduate level mastery of the subject, and a graduate level paper will be required. Students may not take BIOE 500 level graduate courses that cover subject matter that the student has previously taken either at the graduate or undergraduate level.

Successful completion of a biology department comprehensive examination is also required.

MASTER OF ARTS IN TEACHING

GENERAL SCIENCE

For current information concerning this program, consult the "Department of Physics" section of this catalog.