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## BIOLOGICAL SCIENCES

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### FACULTY

**Chairperson:** Professor Hardy Moore

**Professors:** Kevin Curry, John Jahoda,  
Sandra Whelan

**Associate  
Professors:** Michael Carson,  
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**Assistant  
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**Web site: [www.bridgew.edu/catalog/biosci.htm](http://www.bridgew.edu/catalog/biosci.htm)**

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### DEGREE PROGRAMS

- BS in Biology  
Concentrations: General, Biomedical, Cell/  
Molecular, Environmental
- BA in Biology
- MAT - Biology

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### UNDERGRADUATE MINOR

- Biology

The department offers an undergraduate program leading to the degree of Bachelor of Sciences 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 for participating 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 Watershed Access Laboratory is designed for use in teacher professional development in environmental education and for interdisciplinary watershed studies.

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## UNDERGRADUATE PROGRAMS

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Each student majoring in biology will be assigned an adviser from among the faculty of the department. Students should consult with their advisers frequently to receive academic counseling and to verify that they are completing the requirements for graduation.

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## BACHELOR OF SCIENCE

The department offers a B.S. degree program with four concentrations: Environmental Biology, Biomedical, Cell/Molecular Biology and General Biology. All B.S. students take a core consisting of General Biology I and General Biology II, Cell Biology, Ecology, Genetics and one course in Physiology. In addition to the core requirements each B.S. student will select one of the four concentrations in consultation with the faculty adviser within the department and plan a program of study appropriate to the concentration.

The **Environmental Biology** concentration includes course work in 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** concentration features course work in Human Anatomy and Physiology, Histology, Immunology, Microbiology, Virology and Embryology. Internship opportunities are available in local hospitals and research laboratories.

The **Cell/Molecular Biology** concentration allows students to focus their study of biological mechanisms at the cellular and molecular level. Courses available include: Biochemistry, Electron Microscopy and Neurobiology. This concentration is designed for students who may want to pursue graduate studies in molecular or cellular biology and for those who seek a career in cell/molecular biology or biotechnology research.

The **General Biology** concentration allows for a less specialized program of study and is designed for students needing broad biological training. This program can be tailored to the student with individualized interests or can be designed to provide a diverse background in biology. The general biology concentration is required for students considering teaching as a career.

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## BACHELOR OF SCIENCE IN BIOLOGY

### Core Courses

BI 121-122 General Biology I and II  
BI 200 Cell Biology

BI 225 Ecology  
BI 321 Genetics  
One course in Physiology

### **Cognates:**

CH 131-132 General Chemistry I and II  
CH 343-344 Organic Chemistry I and II  
MA 141 Elements of Calculus I  
PH 181-182 Elements of Physics I and II

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## ENVIRONMENTAL CONCENTRATION

Biology Core Courses in addition to the following:

### *Required Courses:*

BI 341 Plant Physiology  
BI 428 Microbiology  
MA 142 Elements of Calculus II or a course in applied statistics  
CS 105 Computers and Their Applications: An Introduction  
or  
CH 100 Computer Science in Chemistry

### *Electives (12 credits from the following list):*

BI 240 Plant Morphology  
BI 284 Invertebrate Zoology  
BI 325 Ichthyology  
BI 326 Marine Biology  
BI 327 Wetlands Biology  
BI 370 Vertebrate Zoology  
BI 372 Animal Behavior  
BI 373 Animal Physiology  
BI 408 The Biology of Marine Mammals  
BI 420 Limnology  
BI 426 Biomonitoring  
BI 444 Biology of the Fungi

### *Electives in Other Disciplines*

(6 credits from the following list):

ES 240 Hydrology  
ES 305 Physical Oceanography  
ES 306 Biological Oceanography  
ES 440 Contaminant Hydrogeology  
GE 317 Air Photo Interpretation – Remote Sensing  
GE 417 Satellite Image Processing Applications to the Environment  
GE 419 Geographical Information Systems  
ID 350 Soil Identification and Interpretation for Land Use

## General Education Requirements (GER)

A minimum of 120 earned hours is required for graduation. These earned hours include General Education 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.

### INTERNSHIP/RESEARCH

Biology majors concentrating in Environmental Biology should strive to qualify for a *three credit internship or research experience as part of their concentration electives*. This could range from volunteer experience through the Student Conservation Association, paid internships with regulatory agencies such as the Massachusetts Department of Environmental Protection or the National Park Service, or research with professional investigators at Bridgewater State College through Undergraduate Biological Research (BI 497).

Students interested in developing a field experience through Internship in Biology (BI 498) must meet the following criteria to be considered:

- completed at least 54 credits and at least two semesters of biology at Bridgewater State College.
- maintained a minimum 2.5 cumulative GPA and a 2.7 GPA in biology.
- filed a completed application form with the department chairperson by the middle of the semester prior to when the field experience is to be undertaken.
- located a faculty adviser who will oversee the specific internship.

Internship applications will be screened by the department and sent to the dean for approval. The approved form must be received by the Registrar's Office in order to enroll for internship credits. No more than three (3) credits of BI 498 can be used toward concentration electives.

### BIOMEDICAL CONCENTRATION

Biology Core Courses in addition to the following:

#### *Required Courses*

BI 251-252 Human Anatomy and Physiology I and II  
A course in applied statistics

#### *Electives*

12 credits at the 300 or 400 level including *at least three courses from the following list*. See the *Course Descriptions* section in this catalog for all additional 300-400 level courses:

BI 371 Histology  
BI 375 Immunology  
BI 376 General Endocrinology  
BI 382 Comparative Chordate Anatomy  
BI 428 Microbiology

BI 430 Embryology  
BI 434 Biological Electron Microscopy  
BI 450 Virology  
BI 472 Human Genetics  
BI 482 Neurobiology

### General Education Requirements (GER)

A minimum of 120 earned hours is required for graduation. These earned hours include General Education 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.

### CELL/MOLECULAR CONCENTRATION

Biology Core Courses in addition to the following:

#### *Required Courses*

BI 341 Plant Physiology  
or  
BI 373 Animal Physiology  
BI 428 Microbiology  
MA 142 Elements of Calculus II or a course in applied statistics or computer science

#### *Electives*

12 credits at the 300 or 400 level including *at least three courses from the following list*. See the *Course Descriptions* section in this catalog for all additional 300-400 level courses:

BI 320 Biochemistry  
BI 350 Molecular Biology  
BI 375 Immunology  
BI 410 Techniques of Molecular Biology  
BI 433 Cytology  
BI 434 Biological Electron Microscopy  
BI 450 Virology  
BI 482 Neurobiology

### General Education Requirements (GER)

A minimum of 120 earned hours is required for graduation. These earned hours include General Education 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 CONCENTRATION

Biology Core Courses in addition to the following:

#### *Required Courses*

BI 341 Plant Physiology  
BI 373 Animal Physiology

BI 428 Microbiology  
MA 142 Elements of Calculus II or a course in applied statistics or computer science

#### *Electives*

Three courses at or above the 200 level totaling at least nine credits. See the *Course Descriptions* section in this catalog for all additional courses.

#### **General Education Requirements (GER)**

A minimum of 120 earned hours is required for graduation. These earned hours include General Education 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.

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#### **MINOR IN SECONDARY (HIGH SCHOOL, MIDDLE SCHOOL OR PREK-12 SPECIALIST) EDUCATION**

Students may minor in Secondary (High School, grades 8-12 Middle School, grades 5-8 or PreK-12 specialist) Education. Successful completion of these programs will lead to Massachusetts Initial Teacher Licensure. Please refer to the *Department of Secondary Education and Professional Programs* for specific teacher licensure and program requirements. Students who wish to obtain a minor in Secondary Education with a view toward licensure in Biology must take the General Concentration and the following biology electives:

- BI 422 Biological Evolution  
or
- BI 118 Evolution (substitutes for one 200 level elective)
- BI 382 Comparative Chordate Anatomy  
or
- BI 284 Invertebrate Zoology  
Physiology Sequence:  
BI 251-252 Human Anatomy and Physiology I and II (preferred)  
or
- BI 373 Animal Physiology
- BI 341 Plant Physiology

Students with a minor in education must refer to the *Department of Secondary Education and Professional Programs* for specific teacher licensure and program requirements. Students preparing to teach at the secondary level must complete the B.S. degree in biology.

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#### **BACHELOR OF ARTS**

The B.A. degree provides training for those who wish to use biological knowledge in association with another career goal. Examples of such careers are elementary education, science writing, scientific illustration, technical sales, work for a publishing company or similar vocations.

The B.A. degree requires a minimum of 12 courses with the following specifications:

- BI 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
- CH 131-132 General Chemistry I-II

#### **General Education Requirements (GER)**

A minimum of 120 earned hours is required for graduation. These earned hours include General Education 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.

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#### **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.

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#### **BIOLOGY MINOR**

A minor consists of a minimum of 18 credits in biology. Students must take BI 121 and BI 122 General Biology I and II or their equivalent and four additional courses in biology at or above the 200 level planned in consultation with the chairperson of biological sciences.

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#### **HONORS PROGRAM**

The Department of Biological Sciences offers a Departmental Honors Program in Biology. This program provides an opportunity for well-qualified biology majors to conduct independent research in biology. Contact the Department of Biological Sciences 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, BI 497 Undergraduate Biological Research is offered by one faculty member who directs and supervises 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, often followed by 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 valuable dimension that is not provided by ordinary course work.

## GRADUATE PROGRAMS

### 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 M.A.T. 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 Graduate and Continuing Education section of the catalog for information regarding graduate program procedures and admission standards.

All accepted students must enroll under the direction of their adviser in GP 501 Graduate Program Planning, which is described under "Graduate Advisors and Program Planning" in the Graduate and Continuing Education section of this catalog.

## Program Requirements

Education Core Courses 15 credits

- ED 530 The Teacher as Researcher
- ED 531 The Standards-Based Classroom: Curriculum
- ED 532 The Teacher as Leader: From Issues to Advocacy
- ED 533 The Standards-Based Classroom: Instruction and Assessment
- ED 538 The Professional Teacher (final program course)

Information about ED 530-538 is provided in the *Course Descriptions* section of this catalog under the heading of "School of Education and Allied Studies (SEAS) Master's Courses (ED)".

### Concentration Requirements

M.A.T. 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.)

- BE 511 Advanced Biological Topics and Techniques
- BE 512 Advances in Biological Science
- BE 513 Advances in Cell/Molecular Biology
- BE 514 Advances in Biomedical/Physiological Biology
- BE 515 Advances in Ecological/Environmental Biology
- BI 503 Directed Study or other approved course

BE 511 - BE 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 BE 511 - BE 515 will be addressed by the requirements of graduate level companion courses designated by the department. Graduate students enrolled in the BE 500 level courses will receive additional assignments and exam questions for evaluation of graduate level mastery of the subject and a graduate level paper will be required. Students may not take BE 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.