

Biological Sciences

Department of Biological Sciences

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Overview

The Department of Biological Sciences offers three programs leading to baccalaureate degrees and two that are combined undergraduate/graduate degree programs.

The bachelor of arts degree. Students qualify for the bachelor of arts degree by successfully completing at least 33 credits of biology-related coursework plus 38 credits in chemistry, physics and mathematics. The curriculum for the BA program includes required core courses, as well as elective laboratory and lecture courses. It is designed to provide a broad-based education in the biological sciences.

The bachelor of science degree. Students qualify for the bachelor of sciences degree by successfully completing 44 credits of biology-related coursework plus 38 credits of chemistry, physics, and mathematics. The BS program is designed to provide the opportunity for in-depth study within particular sub-disciplines of the biological sciences; specific curricula have been formulated for study in (a) cell and molecular biology, (b) ecology and evolutionary biology, (c) pre-health studies, and (d) neurobiology.

The bachelor of science degree in bioinformatics and computational biology. In this highly interdisciplinary program, students integrate coursework in applied mathematics, computer science, and the biological sciences and learn how to apply mathematics and computing to the study of genes and proteins. This training prepares students for graduate education in a bioinformatics-related field or for entry into the workforce of this emerging discipline.

The university offers this bachelor of science degree in bioinformatics and computational biology with options for a concentration in biology, computer science and engineering, and mathematics. Please refer to the bioinformatics and computational biology program for further details.

The combined bachelor of arts/master of science degree. To qualify for the combined degree, students must complete 30 credits of biology-related coursework and 38 credits of chemistry, physics, and mathematics in three years of undergraduate study. Then, following admission into the department's graduate program, students must complete an additional 38 credits of graduate coursework over two years. A combined BA/MS degree is awarded after only five years of study. (When the two degrees are completed separately, a BA degree normally takes four years and an MS degree normally takes two years.)

The combined Bachelor of Science/Doctor of Dental Surgery degree. This program combines three years of undergraduate study in biological sciences and four years of graduate work in dentistry, and a combined BS/DDS degree is awarded after seven years. Applicants may be accepted into the program prior to the beginning of the freshman year or while enrolled as a major in the Department of Biological Sciences. Further details concerning this program may be found at the School of Dental Medicine website: www.sdm.buffalo.edu.

In addition to baccalaureate degrees, the Department of Biological Sciences offers a minor in the biological sciences. To qualify, students must complete a short list of prerequisite, required and elective courses, achieving a total of 22 biology-related credits and 15 chemistry credits. A special biotechnology minor is also available for chemical engineering students.

About our Degrees

Acceptance Criteria - B.A. and B.S.

Minimum GPA of 2.0 in [BIO 200-BIO 201](#), [CHE 101-CHE 102](#), and [MTH 121-MTH 122](#) (or their equivalent).

Acceptance Criteria - Minor

Minimum GPA of 2.0 in [BIO 200](#) and [BIO 201](#).

Acceptance Criteria - B.A./M.S.

Initial Acceptance to B.A. Program:

Minimum GPA of 2.0 in [BIO 200](#), [BIO 201](#), [CHE 101-CHE 102](#), and [MTH 121-MTH 122](#) (or their equivalent).

Subsequent Upgraded Application to B.A./M.S. Program:

Minimum GPA of 3.0 in science courses, minimum GPA of 3.0 in general education courses, and three letters of recommendation.

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Acceptance Information

The department encourages students to apply in February of their sophomore year.

Deadlines: Rolling

Number of applicants/year: 100

Number of accepted majors/year: 60

Total number of majors currently enrolled: 240

Degree Requirements

Please see [Degrees and Policies](#).

About our Courses

Suggested Introductory Courses

- [BIO 200](#) Evolutionary Biology
- [CHE 101](#) General Chemistry
- [MTH 121](#) Survey of Calculus and Its Applications I or [MTH 141](#) College Calculus I

The typical class size for:

Freshman/introductory courses is: 300 - 400

Sophomore/intermediate courses is: 60 - 150

Upper level/advanced courses is: 10 - 100

In the Department of Biological Sciences, what do teaching assistants (TA's) do?

TA's are employed as teachers for undergraduate instructional laboratories, and they assist in recitation instruction and course grading.

About our Faculty

Eleven faculty have been awarded the SUNY Chancellor's Award for Excellence in Teaching and another is a Distinguished Teaching Professor. The Department of Biological Sciences encourages active involvement in faculty research projects.

See a list of our [Undergraduate Faculty](#).

Acceptance Information

Except for the BS degree program in bioinformatics and computational biology, the department accepts students as majors after they have successfully completed both of the following two groups of courses with a minimum GPA of 2.0 in each group:

- 1) A two-semester course in general chemistry ([CHE 101-CHE 102](#), or equivalent) plus a two-semester course in college calculus ([MTH 121-MTH 122](#), [MTH 141-MTH 142](#), or equivalent)
- 2) Two college-level biology courses ([BIO 200](#), [BIO 201](#), or equivalent).

These criteria apply to all students, regardless of whether they started college at UB or transferred to UB from another institution. The application form, including a current DARS report, is to be submitted directly to the Department of Biological Sciences.

For the BA/MS combined degree program, undergraduate biology majors (BA or BS) apply at the end of their sophomore year or the beginning of their junior year. A minimum GPA of 3.0 in both science and general education courses and three supportive letters of recommendation from faculty are needed. The combined degree is awarded at the completion of the fifth year of the program. Separate BA and MS degrees are not awarded.

Transfer Policy

Students transferring to UB from other institutions may use course credits achieved elsewhere to meet requirements for baccalaureate degrees offered by the department. Courses from other institutions that have been previously evaluated in comparison to UB courses are listed on UB's

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course articulation web site, <http://www.taurus.buffalo.edu>. To fulfill requirements with courses that were completed at other institutions but are not listed on the TAURUS web site, students must obtain approval through a petitioning process overseen by the department's director of undergraduate studies. Petition forms are available in the Department of Biological Sciences office, located in 109 Cooke Hall (North Campus). In addition to filling out a petition, the student will be asked to provide supporting documents for transfer courses, such as a catalog description and/or syllabus of the course(s) to be transferred to UB.

Transfer students are reminded that at least 16 credit hours of upper-division coursework must be completed within the department with a minimum GPA of 2.0.

Extracurricular Activities

Undergraduate Biology Association

This organization is an active group open to all students. It sponsors special speakers on research, graduate school, and other selected topics. It also sponsors social activities.

See the [UB Student Association](#).

Practical Experience and Special Academic Opportunities

Undergraduate Research and Practical Experience

A wide range of opportunities are available for students majoring in the biological sciences to gain experience outside of the context of the traditional lecture and laboratory course work that is offered by the department. Among the nationally recognized faculty in the department, many lead externally funded laboratories where students find research positions and thus gain valuable experience under the guidance of their faculty mentors. Students engaged in research may earn credit by enrolling in [BIO 498](#) Undergraduate Research, or in some cases students may be remunerated for their research work if their mentors have grant funds for that purpose.

Honors, Awards, and Scholarships

Students enrolled in the BA or the BS program may participate in the departmental honors program during their senior year. Acceptance into the program may be achieved through invitation by the department, nomination by a sponsoring faculty member, or self-nomination by the student. Nomination forms for the honors program are available in the departmental office, 109 Cooke Hall, North Campus. Honors students must maintain a minimum GPA of 3.25 in all biological science and basic science (chemistry, physics, math) coursework. Requirements for honors also include 6 credits of honors research ([BIO 497](#)) supervised by a member of the faculty and participation in the honors symposium held at the end of the senior year. Three credits of honors research may be used as electives to fulfill requirements for the BA or a BS degree. Honors are noted on transcripts as highest distinction (GPA of 3.75 - 4.0), high distinction (3.5 - 3.74), or distinction (3.2 - 3.49).

The department presents five scholarships to matriculated majors: the Knobloch Endowment Scholarship, the McCroskey Endowment Scholarship, Darryl Raszl Undergraduate Research Fellowship, the Philip G. Miles Undergraduate Research Fellowship and the Alumni Undergraduate Research Fellowship. Award criteria include both academic achievement and financial need.

Career Information and Further Study

An undergraduate degree in biological sciences is excellent preparation for becoming (through graduate studies) a professional biologist. It is also an excellent preparation for post baccalaureate programs such as medicine, dentistry, veterinary medicine, optometry, podiatry and chiropractic. It can lead to teaching certification, medical or science librarianship, public health, nutrition, genetic counseling, environmental and waste management positions, and other professions.

Skills gained in this program include:

- Creating and writing reports to explain the basis and methodologies for complex scientific research findings;
- Leading a group of people in the implementation of a specific scientific procedure or laboratory experience;
- Testing the quality of biological products and identifying bacterial contaminants.
- Caring for laboratory animals;
- Using complex data collection equipment such as microscopes, dissection tools, and computer instruments;
- Gathering and interpreting scientific data about wildlife or human populations;
- Predicting the effects of chemical pollutants on various life forms and ecosystems;
- Improving industrial methods for processing food, wood, cotton, or biological pharmaceuticals;
- Identifying and protecting different species of plants, fish, and wildlife;
- Organizing large projects by harnessing the talents of diverse groups of people and allocating responsibilities accordingly;
- Teaching, instructing and consulting various people and organizations on complex issues and theories;
- Using complex pieces of equipment for data input and analysis;

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- Impacting political environments to produce changes.

Career Choices

- Author or technical writer
- Biologist
- Chemist
- Cloth technologist
- Crime laboratory analyst
- Document restorer
- Environmental analyst
- Food and drug inspector
- Horticulturist
- Hydrologist
- Industrial hygienist
- Laboratory assistant
- Medical librarian
- Medical technologist
- Museum technician
- Neuroscientist
- Paleontological helper
- Patent examiner
- Pest controller
- Pharmacist
- Physician
- Professor or teacher
- Public health educator
- Range manager
- Scientific photographer
- Veterinarian
- Zoologist

Work settings include:

- Agricultural organizations
- Botanical parks, gardens and nurseries
- Cattle ranches
- Federal, state and local regulatory or public agencies
- Health agencies
- Food production corporations
- Hospitals and clinical laboratories
- Industrial and/or research firms
- Pharmaceutical companies
- Private industry
- Rehabilitation and training centers for the mentally and physically disabled
- Scientific publishing
- Seed supplier
- Strip-mining companies
- Textile manufacturer
- Universities and primary or secondary schools
- U.S. Patent Office and Department of Commerce
- Wood and paper producers
- Zoos, aquariums, and museums

Salary Information

Salaries can vary greatly among different occupations, geographic areas, and organizations and companies. According to the Fall 2008 NACE national salary survey for bachelor's degree candidates the average salary for biological science graduates is \$35,522; for chemistry graduates is \$43,951; and for environmental science graduates is \$38,838. The complete Fall 2008 NACE national salary survey is located in Career Services, 259 Capen Hall.

Career Hints

To conduct research, a Ph.D. degree is needed. Students interested in graduate study should check the availability of teaching assistantships and research fellowships to pay expenses. A bachelor's degree prepares one for such positions as laboratory assistant, technician, or inspector, but openings at this level tend to be competitive, and it is wise to seek out opportunities for honing one's skills in technical writing, data processing, biometrics (statistics), and laboratory techniques.

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Practical applications in biology include agriculture, forestry, medicine and various health-related fields; however, more specialized or advanced education may be necessary for these occupations. Students who wish to pursue biology or medicine in graduate training or as a career may engage in research projects with faculty members or seek out volunteer opportunities within health care facilities.

What percentage of graduates goes on to find related employment?

30%

What percentage of graduates goes on to graduate school?

30% to graduate school; 40% to medical school

Degrees Offered

Undergraduate: BA, BS, Minor

Combined: BA/MS, BS/DDS

Graduate: MA, MS, PhD

Links to Further Information About this Program

- [Undergraduate Catalog](#)
- [Undergraduate Admissions](#)
- [Graduate Admissions](#)
- [Department of Biological Sciences](#)
- [College of Arts and Sciences](#)

Biological Sciences - B.S.

Acceptance Criteria

Minimum combined GPA of 2.0 in [BIO 200](#) and [BIO 201](#), and minimum combined GPA of 2.0 in [CHE 101](#), [CHE 102](#), [MTH 121](#) (or [MTH 141](#)) and [MTH 122](#) (or [MTH 142](#)).

Advising Notes

Minimum GPA of 2.0 in biology courses and minimum GPA of 2.0 in required chemistry, physics, and mathematics courses for degree conferral.

Students may choose to concentrate their study in one of the following four programs: (1) cell and molecular biology, (2) ecology and evolutionary biology, (3) pre-health studies or (4) neurobiology. Details of these programs are available at <http://www.biology.buffalo.edu>.

Prerequisite Courses

[BIO 200](#) Evolutionary Biology

[BIO 201](#) Cell Biology

[CHE 101](#) General Chemistry

[CHE 102](#) General Chemistry

[MTH 121](#) Survey of Calculus and Its Applications I or [MTH 141](#) College Calculus I

[MTH 122](#) Survey of Calculus and Its Applications II or [MTH 142](#) College Calculus II

Required Courses

[BIO 203](#) General Physiology

[BIO 205](#) Fundamentals of Biological Chemistry

[BIO 319](#) Genetics

[CHE 201](#) Organic Chemistry

[CHE 202](#) Organic Chemistry

[PHY 101/PHY 151](#) College Physics I/Lab or [PHY 107](#) General Physics I

[PHY 102/PHY 152](#) College Physics II/Lab or [PHY 108/PHY 158](#) General Physics II/Lab

Four BIO lab courses: choices include [BIO 213](#) General Physiology Laboratory, [BIO 215](#) Fundamentals of Biological Chemistry Laboratory, [BIO 310](#) Ecology Methods, [BIO 329](#) Genetics Laboratory, [BIO 332](#) Adv. Molecular Biology Laboratory, [BIO 370](#) Developmental Biology Laboratory, [BIO 400](#) Bioinformatics, [BIO 458](#) Molecular Ecology, 2 cr of [BIO 497](#) Honors Research or [BIO 498](#) Undergraduate Research

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BIO electives or preapproved elective courses from other departments (see list at <http://biologicalsciences.buffalo.edu>) to reach 44 credit hours minimum for the BS degree (at least 3 credit hours of BIO electives must be at the 400-level). No more than 3 credits of any combination of [BIO 495](#), 497, 498, or 499 may count towards the BS degree.

Summary

Total required credit hours for the major - 82

See [Baccalaureate Degree Requirements](#) for general education and remaining university requirements.

Recommended Sequence of Program Requirements

FIRST YEAR

Fall [BIO 200](#), [CHE 101](#); [MTH 121](#) or [MTH 141](#)

Spring [BIO 201](#), [CHE 102](#); [MTH 122](#) or [MTH 142](#)

SECOND YEAR

Fall [BIO 203](#), BIO lab course, [CHE 201](#)

Spring [BIO 205](#), BIO lab course, [CHE 202](#)

THIRD YEAR

Fall [BIO 319](#), BIO lab course, one elective

Spring one BIO lab course, two electives

FOURTH YEAR

Fall [PHY 101/PHY 151](#) or [PHY 107](#)

Spring [PHY 102/PHY 152](#) or [PHY 108/PHY 158](#)

Fall or Spring Remaining electives

Biological Sciences - B.A.

Acceptance Criteria

Minimum combined GPA of 2.0 in [BIO 200](#) and [BIO 201](#), and minimum combined GPA of 2.0 in [CHE 101](#), [CHE 102](#), [MTH 121](#) (or [MTH 141](#)) and [MTH 122](#) (or [MTH 142](#)).

Advising Note

Minimum GPA of 2.0 in biology courses and minimum GPA of 2.0 in required chemistry, physics, and mathematics courses for degree conferral.

Prerequisite Courses

[BIO 200](#) Evolutionary Biology

[BIO 201](#) Cell Biology

[CHE 101](#) General Chemistry

[CHE 102](#) General Chemistry

[MTH 121](#) Survey of Calculus and Its Applications I or [MTH 141](#) College Calculus I

[MTH 122](#) Survey of Calculus and Its Applications II or [MTH 142](#) College Calculus II

Required Courses

[BIO 203](#) General Physiology

[BIO 205](#) Fundamentals of Biological Chemistry

[BIO 319](#) Genetics

[CHE 201](#) Organic Chemistry

[CHE 202](#) Organic Chemistry

[PHY 101/PHY 151](#) College Physics I/Lab or [PHY 107](#) General Physics I

[PHY 102/PHY 152](#) College Physics II/Lab or [PHY 108/PHY 158](#) General Physics II/Lab

Three BIO lab courses: choices include [BIO 213](#) General Physiology Laboratory, [BIO 215](#) Fundamentals of Biological Chemistry Laboratory, [BIO 310](#) Ecology Methods, [BIO 329](#) Genetics Laboratory, [BIO 332](#) Adv. Molecular Biology Laboratory, [BIO 370](#) Developmental Biology Laboratory, [BIO 400](#) Bioinformatics, [BIO 458](#) Molecular Ecology, 2 cr of [BIO 497](#) Honors Research or [BIO 498](#) Undergraduate Research
BIO electives or preapproved elective courses from other departments (see list at <http://www.biology.buffalo.edu>) to reach 33 credit hours minimum for the BA degree. No more than 3 credits of any combination of [BIO 495](#), 497, 498, or 499 may count towards the BS degree.

Summary

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Total required credit hours for the major - 71

See [Baccalaureate Degree Requirements](#) for general education and remaining university requirements.

Recommended Sequence of Program Requirements

FIRST YEAR

Fall [BIO 200](#), [CHE 101](#); [MTH 121](#) or [MTH 141](#)

Spring [BIO 201](#), [CHE 102](#); [MTH 122](#) or [MTH 142](#)

SECOND YEAR

Fall [BIO 203](#), elective(s) or lab(s), [CHE 201](#)

Spring [BIO 205](#); elective(s) or lab(s); [CHE 202](#)

THIRD YEAR

Fall [BIO 319](#); BIO elective(s) or lab(s)

Spring elective(s) or lab(s)

FOURTH YEAR

Fall [PHY 101/PHY 151](#) or [PHY 107](#); elective(s)

Spring [PHY 102/PHY 152](#) or [PHY 108/PHY 158](#); elective(s)

Biological Sciences - B.A./M.S.

Acceptance Criteria

INITIAL ACCEPTANCE TO BA PROGRAM

Minimum combined GPA of 2.0 in [BIO 200](#) and [BIO 201](#), and minimum combined GPA of 2.0 in [CHE 101](#), [CHE 102](#), [MTH 121](#) (or 141) and [MTH 122](#) (or 142).

SUBSEQUENT UPGRADED APPLICATION TO BA/MS PROGRAM

Minimum GPA of 3.0 in science courses, minimum GPA of 3.0 in general education courses, completion of [CHE 201-202](#), [BIO 203](#), and [BIO 205](#), and three letters of recommendation.

Prerequisite Courses

[BIO 200](#) Evolutionary Biology

[BIO 201](#) Cell Biology

[CHE 101](#) General Chemistry

[CHE 102](#) General Chemistry

[MTH 141](#) College Calculus I

[MTH 122](#) Survey of Calculus and Its Applications II or [MTH 142](#) College Calculus II

Required Courses

[BIO 203](#) General Physiology

[BIO 205](#) Fundamentals of Biological Chemistry

[BIO 319](#) Genetics

[BIO 600](#) Problems in Biology

[BIO 608](#) Graduate Research

[BIO 610](#) Graduate Student Seminar

[BIO 614](#) Departmental Seminar

[CHE 201](#) Organic Chemistry

[CHE 202](#) Organic Chemistry

[PHY 101/PHY 151](#) College Physics I (including [PHY 151](#) lab) or [PHY 107](#) General Physics I

[PHY 102/PHY 152](#) College Physics II/Lab or [PHY 108/PHY 158](#) General Physics II/Lab

Three BIO lab courses: choices include [BIO 213](#) General Physiology Laboratory, [BIO 215](#) Fundamentals of Biological Chemistry Laboratory, [BIO 310](#) Ecology Methods, [BIO 329](#) Genetics Laboratory, [BIO 332](#) Adv. Molecular Biology Laboratory, [BIO 370](#) Developmental Biology Laboratory, [BIO 400](#) Bioinformatics, [BIO 458](#) Molecular Ecology, 2 cr of [BIO 497](#) Honors Research or [BIO 498](#) Undergraduate Research
18 credit hours of graduate-level electives (should be selected in consultation with faculty advisor)

Summary

Total required credit hours for the undergraduate portion - 102

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See [Baccalaureate Degree Requirements](#) for general education and remaining university requirements.

Refer to the Graduate School's Policies and Procedures Manual for requirements for master's degree candidates.

Recommended Sequence of Program Requirements

FIRST YEAR

Fall [BIO 200](#), [CHE 101](#); [MTH 121](#) or [MTH 141](#)

Spring [BIO 201](#), [CHE 102](#); [MTH 122](#) or [MTH 142](#)

SECOND YEAR

Fall [BIO 203](#), BIO lab course, [CHE 201](#)

Spring [BIO 205](#), BIO lab course, [CHE 202](#)

THIRD YEAR

Fall [BIO 319](#), BIO lab course; [PHY 101/PHY 151](#) or [PHY 107](#)

Spring electives, BIO lab courses; [PHY 102/PHY 152](#) or [PHY 108/PHY 158](#)

FOURTH YEAR

Fall [BIO 600](#), [BIO 610](#), [BIO 614](#), 8 credit hours of graduate-level electives

Spring [BIO 600](#), [BIO 610](#), [BIO 614](#), 8 credit hours of graduate-level electives

FIFTH YEAR

Fall [BIO 608](#), [BIO 610](#), [BIO 614](#), 2 credit hours of graduate-level electives

Spring [BIO 608](#), [BIO 610](#), [BIO 614](#)

Biological Sciences - B.S./D.D.S.

Acceptance Criteria

INITIAL ACCEPTANCE TO BS/DDS PROGRAM

Applications for entry into the combined BS/DDS program are to be submitted to the Student Admissions Committee of the School of Dental Medicine. Visit <http://www.sdm.buffalo.edu> for details.

Advising Notes

Minimum GPA of 3.5 overall and 3.5 in required science courses (biological sciences, chemistry, physics and mathematics) at the undergraduate level prior to entering dental curriculum.

Prerequisite Courses

[BIO 200](#) Evolutionary Biology

[BIO 201](#) Cell Biology

[CHE 101](#) General Chemistry

[CHE 102](#) General Chemistry

[MTH 121](#) Survey of Calculus and Its Applications I or [MTH 141](#) College Calculus I

[MTH 122](#) Survey of Calculus and Its Applications II or [MTH 142](#) College Calculus II

Required Courses

[BIO 203](#) General Physiology

[BIO 205](#) Fundamentals of Biological Chemistry

[BIO 319](#) Genetics

[CHE 201](#) Organic Chemistry

[CHE 202](#) Organic Chemistry

[PHY 101/PHY 151](#) College Physics I (including [PHY 151](#) lab) or [PHY 107](#) General Physics I

[PHY 102/PHY 152](#) College Physics II/Lab or [PHY 108/PHY 158](#) General Physics II/Lab

Three BIO lab courses: choices include [BIO 213](#) General Physiology Laboratory, [BIO 215](#) Fundamentals of Biological Chemistry Laboratory,

[BIO 310](#) Ecology Methods, [BIO 329](#) Genetics Laboratory, [BIO 332](#) Adv. Molecular Biology Laboratory, [BIO 370](#) Developmental Biology

Laboratory, [BIO 400](#) Bioinformatics, [BIO 458](#) Molecular Ecology, 2 cr of [BIO 497](#) Honors Research or [BIO 498](#) Undergraduate Research

Summary

Total required credit hours for the undergraduate portion: 108

See [Baccalaureate Degree Requirements](#) for general education and remaining university requirements.

Biological Sciences

Recommended Sequence of Program Requirements

FIRST YEAR

Fall [BIO 200](#), [CHE 101](#); [MTH 121](#) or [MTH 141](#)

Spring [BIO 201](#), [CHE 102](#); [MTH 122](#) or [MTH 142](#)

SECOND YEAR

Fall [BIO 203](#), BIO lab course, [CHE 201](#), [PHY 101/PHY 151](#) or [PHY 107](#)

Spring [BIO 205](#), BIO lab course, [CHE 202](#), [PHY 102/PHY 152](#) or [PHY 108/PHY 158](#)

THIRD YEAR

Fall [BIO 319](#), BIO lab course

Spring elective, BIO lab course

FOURTH YEAR

Courses from the dental school curriculum.

Biological Sciences - Minor

Acceptance Criteria

Minimum GPA of 2.0 in prerequisite courses.

Advising Notes

Minimum combined GPA of 2.0 in biology-related courses and minimum combined GPA of 2.0 in required chemistry courses is needed for a successful completion of the minor.

Prerequisite Courses

[BIO 200](#) Evolutionary Biology

[BIO 201](#) Cell Biology

Required Courses

[BIO 203](#) General Physiology

[BIO 205](#) Fundamentals of Biological Chemistry

[BIO 215](#) Fundamentals of Biological Chemistry Laboratory

[CHE 101](#) General Chemistry I

[CHE 102](#) General Chemistry II

[CHE 201](#) Organic Chemistry I

BIO electives or preapproved elective courses from other departments (see list at <http://www.biology.buffalo.edu>) at the 300-400 level to reach 22 credit hours of biology-related prerequisite and required coursework (including [BIO 200](#), [BIO 201](#), [BIO 203](#), [BIO 205](#), and [BIO 215](#)).

Summary

Total required credit hours for the minor...37

BIO 129: Perspectives in Human Biology

Credits: 0

Semester(s): Fall

Type: LAB

A non-majors course: not an elective for any degree program in the Department of Biological Sciences

Lectures and laboratory for students who need to fulfill one year of

science plus one semester of lab, a general education requirement. A non-majors course focusing on human biology. Topics include conception, prenatal development, birth, postnatal development, reproduction, aging, disease prevention and treatment, and end of life.

BIO 130: Perspectives in Human Biology

Credits: 0

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Semester(s): Spring
Type: LAB

A non-majors course; not an elective for any degree program in the Department of Biological Sciences

Lectures and laboratory for students who need to fulfill one year of science plus one semester of lab, and a general education requirement. Structural and functional characteristics of living things emphasizing human biology and genetics; the significance of these characteristics with respect to the future of humanity.

BIO 200: Evolutionary Biology

Credits: 5
Semester(s): Fall
Type: LEC/LAB

This course is a limited enrollment (impacted) course. Students who have previously attempted the course and received a grade other than W may not register for this course during the fall or spring semester.

Evidence for evolution; principle of genetics; population genetics; selection (natural, sexual, and kin); evolution of major groups of organisms; speciation; adaptation; coevolution; and sociobiology. This course is a controlled enrollment (impacted) course. Students who have previously attempted the course and received a grade other than W may repeat the course in the summer or only in the fall or spring semester with a petition to the College of Arts and Sciences Deans' Office.

BIO 203: General Physiology

Credits: 3
Pre-requisites: [BIO 200](#) and [BIO 201](#)
Type: LEC

Covers general physiology principles, using cells, plants, and animals as models to illustrate mechanisms by which living organisms maintain internal function and adapt to their external environment. Replaces [BIO 328](#).

BIO 205: Fundamentals of Biological Chemistry

Credits: 3
Semester(s): Spring
Pre-requisites: [CHE 201](#) Or [CHE 203](#) Or [CHE 251](#).
Type: LEC

Basic course in the fundamentals of biological chemistry for students majoring in biological science and nonmajors with an interest in the subject.

BIO 213: General Physiology Laboratory

Credits: 2
Pre-requisites: [BIO 203](#) Or (
Co-requisites: [BIO 203](#) And Co-Requisite [BIO 213](#))
Type: LAB/REC

Computer lab experience to familiarize students with the types of experiments used to demonstrate physiological principles developed in [BIO 203](#). Replaces [BIO 338](#).

BIO 215: Fundamentals of Biological Chemistry Laboratory

Credits: 2
Semester(s): Spring
Type: LEC/LAB

Introductory laboratory course in biological chemistry. Experiments deal with the basic methods of isolation, measurements, and characterization of macromolecules.

BIO 302: Introduction to Molecular Biology

Credits: 3
Semester(s): Fall
Pre-requisites: [BIO 205](#) Or [BCH 403](#)
Type: LEC

Structure and function of molecules, such as carbohydrates, proteins, lipids, and nucleic acids. Enzymes and energetics. Nucleic acid synthesis, replication, transcription, protein synthesis, and the genetic code.

BIO 309: Ecology

Credits: 3
Semester(s): Fall
Type: LEC

Processes that control the abundance and distribution of organisms in their natural environments; emphasizing population, community and evolutionary ecology.

BIO 310: Ecological Methods

Credits: 2
Semester(s): Fall
Type: LEC/LAB

Field exercises to illustrate major concepts of modern ecology, and the techniques and procedures used in ecological research.

BIO 317: Medical Entomology/Parasitology

Credits: 3
Pre-requisites: [BIO 200](#) with a minimum grade of C-
Type: LEC/LAB

The course will relate to latest scientific advances in medical entomology, and vector ecology. It will synthesize information gathered about arthropod-borne disease from a variety of research areas, such as evolutionary biology, biochemistry, epidemiology, and ecology. The course will involve field trips and experiments in the Greater Buffalo Region and/or adjacent states. The course is especially suited for students planning a career in the medical, veterinary and public health/ epidemiological sciences.

BIO 318: Plant Biology

Credits: 3
Semester(s): Fall
Pre-requisites: [BIO 200](#) And [BIO 201](#)
Type: LEC/LAB

This course focuses on land plants and algae. Topics include

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photosynthesis, water relations, plant nutrition, reproduction, development, ecology, economic botany, and others, depending on student interest. Topics will be covered from molecular to organismal levels.

BIO 319: Genetics

Credits: 3

Semester(s): Fall

Pre-requisites: [BIO 201](#) And ([BCH 403](#) Or [BIO 205](#))

Type: LEC

Basic genetic principles emphasizing the molecular basis of heredity. Structure, replication, and function of the genetic material, regulation of gene expression, and genetic recombination.

BIO 329: Genetics Laboratory

Credits: 2

Semester(s): Fall

Pre-requisites: [BIO 319](#) Or [BIO 319](#)

Co-requisites:

Type: LEC/LAB

A semester-long series of experiments planned to simulate an actual research project. Students generate a mutation and isolate the normal gene to complement it. The normal and mutant genes are analyzed using techniques from molecular biology and bioinformatics.

BIO 330: Special Topics

Credits: 1-3

Type: LEC

The content of this course is variable and therefore it is repeatable for credit. The [University Grade Repeat Policy](#) does not apply.

Topics vary by semester.

BIO 332: Advanced Molecular Biology Laboratory

Credits: 3

Pre-requisites: [BIO 302](#) Or [BIO 319](#) and [BIO 215](#) Or [BIO 329](#), Or permission of instructor. Minimum Grade C- in all Pre-Requisites

Type: LAB

Hands-on experience with cellular and molecular techniques used in today's research environment. These techniques include the polymerase chain reaction (PCR), agarose and polyacrylamide gel electrophoresis, immunoblotting, and recombinant protein purification.

BIO 337: Pattern & Process

Credits: 3

Pre-requisites: [BIO 200](#)

Type: LEC

This course is designed to explore the major theoretical underpinnings of evolution as a scientific field. The course will be divided into sections that focus on microevolution, macroevolution, and the evolution of intra and interspecific behavior. Both theoretical and mathematical aspects of the topics will be explored, bringing a

more advanced approach to topics that were introduced in Biology 200 as well as novel areas of study.

BIO 367: Developmental Biology

Credits: 3

Semester(s): Spring

Pre-requisites: [BIO 319](#)

Type: LEC

Cellular and molecular mechanisms involved in growth and differentiation in animal development.

BIO 369: Biology of the Microbes

Credits: 3

Semester(s): Spring

Pre-requisites: [BIO 205](#) or [BCH 403](#)

Type: LEC

This course gives an overview of the cell biology, genetics, development, physiology, ecology, and pathology of a wide variety of prokaryotic and eukaryotic microbes. The course also includes information about the immune system and its interactions with microbes.

BIO 370: Developmental Biology Laboratory

Credits: 2

Semester(s): Spring

Pre-requisites: [BIO 215](#) Or [BIO 329](#) And [BIO 367](#)

Co-requisites: If [BIO 367](#) was not previously taken, student must register for BIO 370LBR And [BIO 367](#) in the same term. Minimum grade C in [BIO 215](#) or [BIO 329](#)

Type: LAB/REC

Studies the morphological aspects of vertebrate development as seen in the chick embryo. Presents various techniques used to study developmental processes.

BIO 400: Bioinformatics / Genome Analysis

Credits: 4

Semester(s): Spring

Pre-requisites: [BIO 319](#)

Type: LEC/LAB

Computerized analysis of genetic information from a biological perspective. Lectures focus on assumptions, limitations, and strategies of bioinformatics algorithms and statistics. Labs use computers to address biological questions.

BIO 401: Advanced Biological Chemistry

Credits: 4

Semester(s): Fall

Pre-requisites: [BIO 205](#) Or Pre-Requisite

Type: LEC

Structure and function of biological macromolecules: proteins, nucleic acids; mechanisms of enzyme catalysis, energy transduction, and metabolic regulation.

Biological Sciences

BIO 402: Advanced Cell and Developmental Biology 1

Credits: 4
Semester(s): Fall
Pre-requisites: [BIO 205](#) or [BCH 403](#)
Type: LEC

Covers major topics in cell and developmental biology at the advanced textbook level. Emphasizes the experimental basis underpinning our current knowledge.

BIO 404: Advanced Molecular Genetics

Credits: 4
Semester(s): Spring
Pre-requisites: [BIO 319](#) with a minimum grade C
Type: LEC

[BIO 401](#) is not a prerequisite for [BIO 404](#)

Biological information flow, replication, transcription, RNA processing, translation and gene expression.

BIO 405: Advanced Cell and Developmental Biology 2

Credits: 4
Semester(s): Spring
Pre-requisites: [BIO 402](#)
Type: LEC

An in depth coverage of recent advances in cell and developmental biology based on research articles in the field.

BIO 406: Signal Transduction

Credits: 3
Pre-requisites: [BIO 205](#) Or Pre-Requisite
Type: LEC

This course discusses how cells respond to stimuli, which encompasses the mechanisms that transmit signals, "crosstalk" between signaling pathways within a cell, and how these signaling pathways generate the multitude of output responses by the cells.

BIO 407: Advanced Ecology

Credits: 3
Semester(s): Fall
Type: LEC

Offered odd calendar years

Advanced course in the foundations of ecology emphasizing population and community ecology. Supplements lectures on basic ecological principles and models with discussions of both current and historically important issues.

BIO 410: Biophysical Aspects of Macromolecules

Credits: 4
Semester(s): Fall
Type: LEC

Applications of spectroscopic techniques to determinations of

kinetic, thermodynamic, and equilibrium constants characterizing interactions between biological macromolecules. Microtubule assembly, hormone/receptor interactions, and lac repressor binding to DNA.

BIO 411: Tropical Marine Ecology

Credits: 3
Semester(s): Fall
Type: LEC

Offered even calendar years

Surveys tropical marine ecosystems, emphasizing coral reef communities. Examines processes controlling abundance and distribution of marine taxa using primary literature.

BIO 412: Field Course in Tropical Marine Ecology

Credits: 1
Semester(s): Fall
Type: LEC

Offered even calendar years

An intensive two week field course in the Bahamas focusing on coral reef communities. Combining lectures, fieldwork, and laboratory analyses, students conduct in depth studies of Caribbean marine habitats.

BIO 417: Neurobiology

Credits: 3
Semester(s): Fall
Pre-requisites: [BIO 205](#) or [BCH 403](#)
Type: LEC

Lectures and class discussions concerning nervous systems and neural functions of humans and other organisms. Emphasizes the physiology, biochemistry, and molecular biology of motor functions, learning, and memory.

BIO 418: Integrative Neuroscience

Credits: 3
Pre-requisites: [BIO 417](#)
Type: LEC

A continuation of [BIO 417](#); examines the major functions of the nervous system, perception and motor control, at molecular, cellular, and systems levels. Covers the neural basis of behavior and the cellular and molecular basis of neural diseases.

BIO 420: Cytogenetics

Credits: 3
Pre-requisites: [BIO 319](#)
Type: LAB

Cytogenetics is the study of the chromosomal basis of heredity. Emphasizes chromosome organization and the segregation of chromosomes during mitosis and meiosis. Hands-on experience in the laboratory through the study of a variety of model systems.

Biological Sciences

BIO 440: Experimental Endocrinology

Credits: 2
Semester(s): Fall
Type: LEC

A course in current experimental research in endocrinology intended for graduate and advanced undergraduate students. An area of focus is chosen each year, with three recent examples being endocrinology of stress, endocrine responses to starvation, and relationships between endocrine and immune systems.

BIO 448: Endocrinology

Credits: 3
Semester(s): Fall
Pre-requisites: [BIO 203](#) Or [PGY 300](#) Or Permission of Instructor
Type: LEC

Structure and function of the ductless glands as they coordinate physiological activities and influence animal behavior.

BIO 449: Comparative Genomics

Credits: 3
Semester(s): Spring
Type: SEM

Explores how growing knowledge of developmental circuits, and their variation, affects our understanding of how organisms evolve.

BIO 456: Evolutionary Genetics

Credits: 3
Semester(s): Spring
Pre-requisites: [BIO 319](#)
Type: LEC

Genetic and population-level processes that underlie evolutionary change; topics include population genetics, the effects of population size and selection, population structure, molecular evolution, intragenomic conflict, molecular phylogenetics, and evolutionary development.

BIO 458: Molecular Ecology

Credits: 2
Semester(s): Spring
Type: LAB

The use of molecular genetic markers is becoming a widespread and important approach to studying ecological phenomena, such as population structure, migration, mating systems, and natural selection. Students learn to isolate and use molecular markers for ecological and evolutionary studies.

BIO 461: Basic Radiation Science

Credits: 4
Semester(s): Fall
Type: LEC/LAB/REC

Production, properties, interactions, dosimetry, detection, and instrumentation of radiation from radioisotopes, radiation-producing

equipment and nuclear reactors, safe-handling procedures, and survey methods.

BIO 495: Undergraduate Supervised Teaching

Credits: 1-4
Semester(s): Fall, Spring
Type: TUT

The content of this course is variable and therefore it is repeatable for credit. The [University Grade Repeat Policy](#) does not apply.

Enrollees participate as undergraduate teaching assistants under the supervision of faculty of the Department of Biological Sciences.

BIO 497: Honors in Biology

Credits: 1-12
Semester(s): Fall, Spring
Type: TUT

The content of this course is variable and therefore it is repeatable for credit. The [University Grade Repeat Policy](#) does not apply.

Research experience during the senior year. Enrollees are sponsored by a member of the faculty of the Department of Biological Sciences. Upon completion of the requirements of an honors research project, recognition is noted on the student's transcript.

BIO 498: Undergraduate Research

Credits: 1-6
Semester(s): Fall, Spring
Type: TUT

The content of this course is variable and therefore it is repeatable for credit. The [University Grade Repeat Policy](#) does not apply.

Students collaborate with faculty research mentors on an ongoing faculty research project or conduct independent research under the guidance of a faculty member.

BIO 499: Independent Study

Credits: 1-4
Semester(s): Fall, Spring
Type: TUT

The content of this course is variable and therefore it is repeatable for credit. The [University Grade Repeat Policy](#) does not apply.

A program that may include laboratory experience, library research, or tutorial study arranged with a faculty sponsor in the Department of Biological Sciences.