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Biology

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The Department of Biology at The College of New Jersey provides undergraduate students with a comprehensive modern education in biology, with subject matter ranging in biological complexity from molecular and cell biology, through organismal biology, and on to ecology and evolutionary biology. The general objectives of the department are: 1) to develop in students an understanding of the biological principles that underlie all living things; 2) to instill in students a sense of inquiry; and 3) to sharpen the analytical thinking skills of students. Students who complete the program receive a Bachelor of Science in biology. The major is a liberal arts-based program that prepares students for a variety of opportunities after graduation, including entry into biology-related professional occupations, pursuit of advanced graduate study in biology, enrollment at medical and allied health professional schools, and teaching at the primary and secondary levels.

Students in the Department of Biology learn firsthand about the work of a biological scientist. They learn about both classic experiments and cutting edge research in biology from the classic literature, the finest textbooks, and current primary scientific literature. In the classroom, in the field, and in laboratories, scientific inquiry is the basis for learning, enhanced and encouraged by experienced, dedicated professors and the shared experiences of the class. Students construct hypotheses, develop research proposals, and hone their investigative and analytical skills through their work in course laboratories, research with faculty members, and mentored research at other institutions. Biology students discuss each other's work, write research papers, and submit their findings via scientific poster presentations. This rich set of experiences allows each student to realize the concept goals of the biology program noted below.

The biology program has been designed to give all majors in the department exposure to the complete range of disciplines within biology. The biology core courses, which are required of all biology students, provide a solid foundation within biology from the molecular to the ecosystem level. Students then supplement this core curriculum through the selection of upper-level biology option courses in their particular areas of interest.

Program Concept Goals

The study of biology is increasingly complex and multi-disciplinary. However, there are central concepts which are fundamental to all biological systems. These concepts constitute the biology program's Concept Goals, which are instilled in each student.

- Within biological systems, structure and function are interdependent.
- Energy production and use underlie all biological processes.
- Expression of a unique subset of genes from an organism's inherited DNA genome determines a cell's particular characteristics.
- Biological diversity is the result of a continuous process of evolution in an ecological context.

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Programs within Biology

There are six programs within the biology major: liberal arts (BIOA), secondary teaching (BIOT), seven-year BS/MD (BIOM), seven-year BS/OD (optometry; BIOP), double major with early childhood education (EACH/BIOA), and double major with elementary education (ELEM/BIOA). There also is a biology specialization within the M/S/T major in Elementary Education, Early Childhood Education, Special Education, and Deaf and Hard of Hearing.

Biology Liberal Arts (BIOA):

BIO 099/Orientation to Biology	0 course unit
BIO 185/Themes in Biology	1 course unit
BIO 211/Biology of the Eukaryotic Cell	1 course unit
BIO 221/Ecology and Field Biology	1 course unit
BIO 231/Genetics	1 course unit
BIO 498/Biological Seminar	0.5course unit
BIO —/Option in Organismal Biology	1 course unit
Four additional biology option courses (by advisement)	4 course units

Total major courses

9.5 course units

CHE 201, 202/General Chemistry I/II	2 course units
CHE 331, 332/Organic Chemistry I/II	2 course units
MAT 127/Calculus A	1 course unit
One additional mathematics course (by advisement)	1 course unit
PHY 201/Physics I	1 course unit

Total required correlate courses

7 course units

Biology Teaching (BIOT):

An overview of the entire secondary-level teacher preparation sequence for students can be found in the section of this bulletin for the Department of Education Administration and Secondary Education.

Students planning to teach middle or high school biology should consult with advisors in both biology and secondary education in planning their academic program. These plans should take into account requirements for: the major, liberal learning, professional courses, and state certification. To be retained in the program, a student must earn at least a 2.5 cumulative grade point average (CGPA) before enrolling in the junior year education sequence. The student must establish a minimum 2.75 CGPA, and must have completed the biology core in order to be allowed to student teach (BIO 490).

Candidates for a teacher-education certificate must have a 2.75 or higher cumulative grade point average to successfully complete their teacher education program. They also must meet the state hygiene/physiology requirement, and pass the appropriate Praxis examination before the New Jersey State Department of Education will issue the appropriate certificate. Teacher-education candidates will receive a “certificate of eligibility with advanced standing” which requires a candidate to be provisionally certified for his or her first year of teaching. After one year of successful teaching, the candidate is eligible for a permanent certificate.

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Major

BIO	099/Orientation to Biology	0 course unit
BIO	185/Themes in Biology	1 course unit
BIO	211/Biology of the Eukaryotic Cell	1 course unit
BIO	221/Ecology and Field Biology	1 course unit
BIO	231/Genetics	1 course unit
BIO	498/Biological Seminar	0.5 course unit
BIO	—/Option in Organismal Biology	1 course unit
	Two additional biology option courses (by advisement)	2 course units

Total major courses **7.5 course units**

Correlates

CHE	201, 202/General Chemistry I, II	2 course units
CHE	331, 332/Organic Chemistry I, II	2 course units
MAT	127, 128/Calculus A/B	2 course units
PHY	201, 202/Physics I, II	2 course units

Total required correlate courses **8 course units**

Professional Education Sequence

SED	224/Adolescent Learning and Development	1 course unit
EFN	299/School and Communities	1 course unit
SED	399/Pedagogy in Secondary Schools	1 course unit
SPE	323/Secondary Content Literacy in Inclusive Classrooms	1 course unit
EFN	398/Historical and Political Context of Schools	1 course unit
BIO	490/Student Teaching	2 course units
SED	498/Collaborative Capstone for Professional Inquiry	1 course unit
PHY	390/Methods of Teaching Science	1 course unit

9 course units

Seven-Year BS/OD (Optometry) Program (BIOP)

This accelerated program works in conjunction with the State University of New York's State College of Optometry in Manhattan and is available to entering first-year students and to enrolled biology first-year students and first-semester sophomores. To be considered, entering first-year applicants will need an SAT of at least 1300 and to be in the top 10 percent of their graduating class. An interview with each institution is required before acceptance into the program. BIOP majors will need to maintain a minimum overall GPA no lower than 3.3, and the GPA in science and mathematics prerequisite courses no lower than 3.3, with no grade below a C. They are expected to take the OAT tests and score a 310 or better.

BIO	099/Orientation to Biology	0 course unit
BIO	185/Themes in Biology	1 course unit
BIO	211/Biology of the Eukaryotic Cell	1 course unit
BIO	221/Ecology and Field Biology	1 course unit
BIO	231/Genetics	1 course unit
BIO	332/Comparative Vertebrate Anatomy	1 course unit
BIO	498/Biological Seminar	0.5 course unit

Total major courses **5.5 course units**

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CHE 201, 202/General Chemistry I, II	2 course units
CHE 331, 332/Organic Chemistry I, II	2 course units
MAT 127/Calculus A	1 course unit
PHY 201, 202/Physics I, II	2 course units
PSY 101/Introduction to Psychology	1 course unit
STA 115/Statistics	1 course unit

Total required correlate courses **9 course units**

The remainder of requirements for the major will be taken at SUNY State College of Optometry.

Seven-Year BS/MD (Medical) Program (BIOM)

This accelerated program with the University of Medicine and Dentistry of New Jersey's New Jersey Medical School in Newark is available to entering first-year students only. To be considered, the candidate will need an SAT of 1400 or better (at one seating) from the critical reading and mathematics sections only, and a class rank within the top 10 percent. An interview with each institution is required before acceptance into the program. To remain in the program, the student needs an overall and semester GPA of 3.5 or higher and a B or better in the required prerequisite science courses.

BIO 099/Orientation to Biology	0 course unit
BIO 185/Themes in Biology	1 course unit
BIO 211/Biology of the Eukaryotic Cell	1 course unit
BIO 221/Ecology and Field Biology	1 course unit
BIO 231/Genetics	1 course unit
BIO 413/Microscopic Anatomy Techniques	1 course unit
One additional biology option course (by advisement)	1 course unit
BIO 498/Biological Seminar	0.5 course unit

Total major courses **6.5 course units**

CHE 201, 202/General Chemistry I, II	2 course units
CHE 331, 332/Organic Chemistry I, II	2 course units
MAT 127/Calculus A	1 course unit
One additional mathematics course (by advisement)	1 course unit
PHY 201, 202/Physics I, II	2 course units

Total required correlate courses **8 course units**

The remainder of requirements for the major will be taken at UMDNJ-NJ Medical School.

Organismal Courses

The BIOA and BIOT biology major will need to enroll in at least one biology course at the organismal level. The courses that fulfill the organismal requirement are the following:

- Microbiology (BIO 312)

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- Plants and People (BIO 315)
- Comparative Vertebrate Anatomy (BIO 332)
- Biology of Seed Plants (BIO 341)
- Biology of the Invertebrates (BIO 342)
- General Entomology (BIO 343)
- Biology of the Fungi (BIO 350)
- Animal Physiology (BIO 411)
- Physiological and Behavioral Ecology (BIO 465)

Elementary Education M/S/T (ELST) or Early Childhood Education M/S/T (ECST) or Deaf and Hard of Hearing M/S/T (DHST) with a Biology Specialization

The M/S/T interdisciplinary major integrates formal study in mathematics, science, and technology to gain a better understanding of the human-designed world in which we all live. The major consists of nine units of courses drawn from a common “core,” one approved M/S/T elective, and a four-unit “specialization” in one of the M/S/T disciplines. Students in the major receive careful course selection advisement so that they qualify for a middle school endorsement in one of the M/S/T disciplines. **All majors must see the M/S/T academic program coordinator for general advisement.**

Students electing a Biology Specialization within the MST major will complete MAT 127/Calculus A and an approved second math course, BIO 185/Themes in Biology, CHE 201/General Chemistry I, and one approved science course, ETE 261/Multimedia Design, ETE 271/Structures and Mechanics, MAT 105/Mathematical Structures and Algorithms for Educators I, TED 460/Integrated M/S/T for the Child/Adolescent Learner, and one M/S/T approved elective. The Biology Specialization consists of two of the following three courses: BIO 211/Biology of the Eukaryotic Cell, BIO 221/Ecology and Field Biology, or BIO 231/Genetics; and two electives at the 200 level or above (BIO211, 221 or 231 may be used as one upper level elective).

M/S/T Suggested First Year Course Sequence

FSP	First Seminar	1 course unit
MAT	127/Calculus A	1 course unit
TST	161/Creative Design	1 course unit
ETE	261/Multimedia Design	1 course unit
	Science Option #1 (by advisement)	1 course unit
	Math or Science Option (by advisement)	1 course unit
	MAT 105/Mathematical Structures and Algorithms for Education I	1 course unit
WRI	102/Academic Writing (if not exempt)*	1 course unit

*It is recommended that students exempted from this course take another liberal learning course.

Total for year 8 course units

Program Entrance, Retention, and Exit Standards

Every major program at the College has set standards for allowing students to remain in that program, to transfer within the College from one program to another, and to graduate from a program.

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The following are the standards for BIOA and BIOT:

- Retention in the program is based on the following performance standards: at the end of the fourth semester at the college, the student must have a minimum cumulative science GPA of 2.0 in all science courses, and must have completed at least three science courses required by the major.
- Transfer into the program from another program within the College is based upon the following performance standards: there must be at least three 100/200-level natural science courses, one of which must be a course for biology majors and one of which must be a course for chemistry or physics majors; and there must be a cumulative GPA of 2.5 or better, and a science GPA of 2.5 or better. Students must submit a completed application to the Department of Biology (which requires two letters of recommendation, one of which must be from a biology professor). Please see department for application.
- Graduation requires: 1) an overall GPA of 2.0 in courses for the program, 2) a cumulative average of 2.0 in all science courses taken at TCNJ, and 3) a cumulative average of C– (1.67) or better in the following core courses: BIO 185, BIO 211, BIO 221, BIO 231, and BIO 498.

The following are the standards for BIOM:

- Retention in the program is based on the following performance standards in these “critical content courses”: overall 3.5 GPA each semester, and a B or better in BIO 185, CHE 201, 202, 331, 332, and PHY 201, 202.
- There is no internal transfer allowed by the articulation agreement.
- Graduation includes credits earned at UMDNJ’s New Jersey Medical School.

The following are the standards for BIOP:

- Retention in the program is based on having a 3.3 GPA in the biology curriculum and a 3.3 in the optometry science and mathematics prerequisites with no grade below a C. For further details consult the optometry advisor regarding the articulation agreement.
- Transfer in the program can only be achieved from the BIOA major and is based on having a 3.3 or better GPA in the required optometry courses and an overall 3.3 or better GPA. For further details consult the optometry advisor regarding the articulation agreement.
- Graduation includes credits earned at S.U.N.Y. Optometry. For further requirements and modifications consult the optometry advisor regarding the articulation agreement.

Biology Minor

The minor consists of five course units:

BIO 185/Themes in Biology

Two of the following:

BIO 211/Biology of the Eukaryotic Cell

BIO 221/Ecology and Field Biology

BIO 231/Genetics

Two additional Biology Options

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The minimum GPA for retention in and completion of the minor is the same as for the major.

A minimum of three of the biology courses for the minor must be taken at TCNJ.

Departmental Honors

The Departmental Honors Program provides advanced research experience and recognition of outstanding achievement. To be eligible, the biology major must have at least eight course units earned at The College of New Jersey, including three course units in biology. The student should have an overall GPA of 3.3 or better, and a science GPA of 3.5 or better. The candidate must make application by written request to the biology department honors advisor. The candidate must complete the biology major with an overall GPA of 3.3 and a science GPA of 3.5 or better. In addition, at least 4.5 course units in biology must be completed at TCNJ, and the student must complete the equivalent of three course units of honors-level independent biology research with a faculty member. The research will culminate with a presentation and a written thesis presented in a form acceptable to a scientific journal. For completion of departmental honors, the student's Honors Review Committee must judge the initial proposal and the final thesis "Honors Quality." Students who successfully complete the program will be certified by the Department of Biology to graduate "With Departmental Honors in Biology."

Marine Sciences Consortium

The College of New Jersey is a member of the New Jersey Marine Sciences Consortium (NJMSC), a group of universities and colleges interested in education and research in the marine sciences. Extensive summer programs conducted at field stations along the New Jersey coastline are available to interested students. In addition, students may take summer courses at the Consortium's field station at Sandy Hook, one of which (Introduction to Marine Biology, BIO 363) can be used to fulfill a biology option requirement. The descriptions of courses offered at Sandy Hook are at the end of the course description list below. Students must register for these courses via TESS, and fill out an application available via the [NJMSC Web site](#).

Study Abroad

One of the opportunities available to students pursuing a degree in biology is to study abroad for a semester or a year. Any student interested in studying abroad should meet with his/her faculty advisor early in his/her college career to plan a curriculum so that the student may complete his/her studies in four years. He/she will also need to meet with the college's [Office of International and Off-Campus Programs](#). The student must receive approval from the chair of biology in order for courses taken abroad to count toward requirements for the major.

Suggested Pre-Medical Curriculum (BIOA Major)

A large number of students whose career goal is in medicine, dentistry, or other allied health fields pursue a pre-medical curriculum through enrollment as a biology major. Careful advisement within the department and through the Medical Careers Advisory Committee is provided. Students interested in pursuing a degree in medicine, or in any of the allied health fields, should take Physics II (PHY 202) in addition to Physics I (PHY 201), in preparation for the Medical College Admissions Test (MCAT). No additional courses are necessary beyond the standard BIOA curriculum.

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Students who are not pursuing a major in biology, yet are considering application to medical school, should contact the Medical Careers Advisory Committee (see Department of Biology office staff or current chair) in order to receive advisement in preparation for medical school.

First Year Suggested Sequence for all biology majors

Fall

FSP First Seminar
BIO 099/Orientation to Biology
BIO 185/Themes in Biology
CHE 201/General Chemistry I
Foreign Language (if not exempted)*/or math/or liberal learning

Spring

BIO 211/Biology of the Eukaryotic Cell **or** BIO 221/Ecology and Field Biology
CHE 202/General Chemistry II
WRI 102/Academic Writing (if not exempted)*
Foreign Language (if not exempted)*/or math/or liberal learning

**It is recommended that students exempted from these courses take other liberal learning courses.*

Within the first four semesters (two years), the student should take BIO 185/Themes in Biology, BIO 211/Biology of the Eukaryotic Cell and BIO 221/Ecology and Field Biology. In addition, students should complete the four semester chemistry sequence. Students may also have the opportunity during the first two years to enroll in either BIO 231/Genetics and/or an organismal biology option course.