The Biology Department (https://www.njcu.edu/academics/schools-colleges/william-j-maxwell-college-arts-sciences/departments/biology) provides numerous academic options to students desiring either Bachelor of Science (BS) or Bachelor of Arts (BA) degrees in Biology and related fields:

1. Broad-based, BS and BA programs in general biology that provide sound preparation for successful entry to employment, graduate school, and/or professional school;
2. Teacher certification programs for students pursuing careers as K–12 teachers with academic interests in biology;
3. Joint and collaborative programs with the University of Medicine and Dentistry of New Jersey and Jersey Shore Medical Center leading to BA or BS degrees and certifications in Clinical Laboratory Sciences and Allied Health Technology; and
4. Graduate and professional affiliated programs designed to prepare high-performing students for careers in research or professional careers in medicine, dentistry, podiatry or osteopathic medicine.

Faculty advisors assist students in selecting appropriate courses for careers in research, education, government, industry, the medical professions, and other related fields. The Biology Department sponsors the Biology Club, the Nu Pi chapter of Beta Beta Beta Biology Honor Society, and a tutoring service for its majors.

**John Grew**, Chairperson  
Professor of Biology  
University of Massachusetts-Lowell, B.S., M.S.; New York University, Ph.D.

**Cindy Jo Arrigo**  
Associate Professor of Biology  
New Jersey City University, B.S.; University of Medicine and Dentistry of New Jersey, Ph.D.

**Meriem Bendaoud**  
Assistant Professor of Biology  
Dental Surgeon Diploma, New Jersey City University, B.S.; Rutgers, The State University of New Jersey, Ph.D.

**Reed Carroll**  
Associate Professor of Biology  
Cornell University, B.A.; Harvard University, Ph.D.

**Natalia Coleman**  
Associate Professor of Biology  
St. Petersburg State Agricultural University, B.S., M.S., Ph.D.

**Anthony Esposito** (aesposito@njcu.edu)  
Assistant Professor of Biology  
City University of New York - College of Staten Island, B.S.; Rutgers University, Ph.D.

**Allison Fitzgerald**  
Assistant Professor of Biology  
University of Maryland, B.S.; Stony Brook University, M.S.; CUNY Graduate Center, NYC, and College of Staten Island, Ph.D.

**Laine Giovanetto**  
Associate Professor of Biology  
College of Lake County, A.S., Southern Illinois University, A.S., B.S., Florida Institute of Technology, M.S., Ph.D.

**Laura Pannaman**  
Professor of Biology  
Brooklyn College, B.A., M.A.; The Graduate Center, City University of New York, Ph.D.

**Ethan Prosen**  
Associate Professor of Biology  
College of Saint Scholastica, B.A., Southwest Missouri State University, M.A., University of Louisiana, Ph.D.

**James R. Siniscalchi**  
Professor of Biology  
Immaculate Conception College, B.A.; St. Bonaventure University, Ph.D.

### Programs

Various discipline-specific concentrations that will prepare students for multiple fields of employment or areas of additional undergraduate/graduate study are noted below. Course requirements for each concentration are explained in detail. The requirements for graduation, in addition to completion of the major area, are listed on "Undergraduate Degree Requirements (https://catalog.njcu.edu/undergraduate/undergraduate-degree-requirements)."

- Biology, B.A. (https://catalog.njcu.edu/undergraduate/arts-sciences/biology/biology-ba)
- Biology, B.S.
- Biology with Teacher Certification (Biology), B.A.
- Biology - Medical Imaging Science—Cardiovascular Sonography Specialization, Joint-Degree Program, B.S.
- Biology - Medical Laboratory Science—Diagnostic Medical Sonography Specialization, Joint-Degree Program, B.S. (https://catalog.njcu.edu/undergraduate/arts-sciences/biology/medical-laboratory-science-joint-degree-bs)
- Biology, B.S./Doctor of Dental Medicine Dual Degree with Rutgers School of Dental Medicine (RSDM) (https://catalog.njcu.edu/undergraduate/arts-sciences/biology/doctor-of-dental-medicine-dual-bs)
- Biology (NJCU) and Biomedical Engineering (NJIT), Dual Degree (3 + 2) Program, B.S. (https://catalog.njcu.edu/undergraduate/arts-sciences/biology/biomedical-engineering-dual)
- Biology, Minor (https://catalog.njcu.edu/undergraduate/arts-sciences/biology/biology-minor)
**Biology (BIOL)**

**BIOL 1XX Biology Transfer Credit (0 Credits)**

**BIOL 2XX Biology Transfer Credit (0 Credits)**

**BIOL 100 General Biology (3 Credits)**

This is an introductory lecture course in contemporary biology designed for the non-scientist.

**BIOL 103 Human Sexual Biology (3 Credits)**

Lecture topics in this course include reproductive anatomy and physiology, conception, prenatal development, birth and sexual expression.

**BIOL 106 Practical Nutrition (3 Credits)**

This course explores the application of nutritional principles to daily health maintenance as well as conditions that require special diet management.

**BIOL 107 Urban Environment (3 Credits)**

**BIOL 110 Biodiversity And Extinction (3 Credits)**

**BIOL 130 Principles Biology I (4 Credits)**

This is a study of the principles of life. Lecture topics include a review of scientific methods and detailed analysis of cellular functions, structures, metabolism and reproduction. Laboratory work is required.

**Pre/Co-Requisite(s): ENGL 101 or ESL 101 and MATH 112**

**BIOL 131 Principles Biology II (4 Credits)**

This is a continuation of BIOL 130. Topics include Mendelian genetics, microbial genetics, chromosomes and sex determination, origin of life, evolution, and an overview of microorganisms, fungi, animals and plants. Lecture/Recitation/Laboratory.

**Pre-Requisite: BIOL 130 Principles of Biology I**

**BIOL 140 Scientific Inquiry (3 Credits)**

This course will enable students to gain insight into how scientific understanding of the 'natural world' emerges. Students will develop scientific inquiry, communication and information literacy skills.

**BIOL 201 Principles of Biology III (4 Credits)**

**BIOL 203 Biology of the Environment (4 Credits)**

Course offers a study of the relationship between humans and their environment. Basic ecological concepts are develop in lectures and applied in field work.

**BIOL 204 Principles of Anatomy & Physiology I (4 Credits)**

**BIOL 217 Life In The Sea (3 Credits)**

An introduction to plants and animals found in the sea and life processes of the seashore and open ocean. Lecture.

**BIOL 220 Professorial Assistant (1 Credit)**

**BIOL 224 The Human Body (3 Credits)**

A study of the human body as a unit; its tissues, organs, and organ systems. Correlation of function and structure is emphasized. Interrelationship of organs and systems are explored in the context of homeostasis.

**BIOL 225 Human Sexual Biology (3 Credits)**

This course provides students an opportunity to demonstrate basic knowledge of human reproductive anatomy and physiology, pregnancy and in utero development, contraception and reproductive disorders, and to explore the evolution of research into human sexual expression.

**Co-Requisite(s): ENGL 101 English Composition I**

**BIOL 230 Cell Biology (4 Credits)**

An introduction to the structure and function of prokaryotic and eukaryotic cells. The organization, physiology and reproduction of cells are overviewed.

**Pre-Requisite(s): BIOL 130and 131**

**BIOL 231 Comparative Anatomy (4 Credits)**

This course studies the major steps in chordate evolution through a comparison of structure, function, and adaptation in selected chordates. Emphasis is placed on vertebrates. Lecture/Recitation/Laboratory.

**Pre-Requisite(s): BIOL 130 Principles of Biology I and BIOL 131 Principles of Biology II**

**BIOL 232 Invertebrate Zoology (4 Credits)**

The anatomy and physiology of invertebrates are examined in a series of lectures with labs.

**Pre-Requisite(s): BIOL 130 Principles of Biology I and BIOL 131 Principles of Biology II**

**BIOL 233 Principles of Botany (4 Credits)**

In Principles of Botany, laboratory work and lectures study the structure, development and life cycles of algae and plants with emphasis on adaptations to the environment, evolutionary trends and relationships.

**Pre-Requisite(s): BIOL 130 Principles of Biology I and BIOL 131 Principles of Biology II**

**BIOL 236 Principles of Anatomy & Physiology I (4 Credits)**

This is a comprehensive study of the structure and function of the human body including the skeletal, muscular, endocrine and nervous systems. This is a required course for medical technology students and is recommended for nursing and paramedical students.

**Pre-Requisite(s): BIOL 130 Principles of Biology I and BIOL 131 Principles of Biology II**

**BIOL 237 Principles of Anatomy & Physiology II (4 Credits)**

This is a continuation of BIOL 236 Principles of Anatomy and Physiology. Topics for lecture/labs include the digestive, excretory, reproductive, circulatory and respiratory systems.

**Pre-Requisite(s): BIOL 130 Principles of Biology I and BIOL 131 Principles of Biology II, BIOL 236 Principles of Anatomy and Physiology I**

**BIOL 240 Scientific Reasoning (3 Credits)**

In this class we will learn how scientists investigate the world, asking certain types of questions, generating empirical evidence, applying logical rigor in answering those questions and subsequently communicating the results of those investigations to different audiences.

**Pre-Requisite(s): ENGL 101 and ENGL 102**

**BIOL 250 Biology Research (1 Credit)**

This is a course individually designed to provide the undergraduate training in biological research. Students work on projects under the guidance and supervision of a faculty member. Written reports and a final paper are required.

**BIOL 252 Evolution: A Biological and Geological Approach (3 Credits)**

This course explores the major concepts of evolution, the foundation that supports all of biology, and the experimental and analytical methods used to study evolutionary change.

**Pre-Requisite(s): BIOL 131 or GEOS 241**

**BIOL 301 General Physiology (4 Credits)**

General Physiology is an integrated lecture/laboratory study of the mechanism of biological control and coordinated body function in vertebrates.

**Pre-Requisite(s): BIOL 230 and CHEM 106 and CHEM 1106.**
BIOL 302 Plant Physiology (4 Credits)
Plant Physiology is a study of maintenance, growth, and reproduction in plants. Laboratories include techniques used in matter and energy relationships in plants.
**Pre-require(s):** BIOL 230 Cell Biology and CHEM 106 General Chemistry II and CHEM 1106 General Chemistry II

BIOL 303 Microbiology (4 Credits)
This course is a survey of microorganisms with emphasis on the bacteria and applications of microbiology. Laboratories stress isolation, cultivation, biochemical, and identification techniques of selected bacteria and other microorganisms. Lecture/Recitation/Laboratory.
**Pre-require(s):** BIOL 130 Principles of Biology I, BIOL 131 Principles of Biology II, CHEM 106 General Chemistry II, CHEM 1106 General Chemistry II, CHEM 208 Organic Chemistry I also recommended

BIOL 304 Genetics (4 Credits)
This study outlines the principles of inheritance including transmission genetics, the biochemical basis of inheritance, gene expression and regulation and mutation.
**Pre-require(s):** BIOL 130 Principles of Biology I, BIOL 131 Principles of Biology II, CHEM 106 General Chemistry II, CHEM 1106 General Chemistry II, CHEM 208 Organic Chemistry I also recommended

BIOL 305 Histology (4 Credits)
This course examines the microscopic anatomy of the vertebrate animal, with particular emphasis on the human. A consideration of cell structure and an overview of the basic tissues serves as the basis for the analysis of the organ systems. Lecture/Recitation/Laboratory.
**Pre-require(s):** BIOL 130 Principles of Biology I, BIOL 131 Principles of Biology II, CHEM 106 General Chemistry II, CHEM 1106 General Chemistry II, CHEM 208 Organic Chemistry I also recommended

BIOL 308 Plant Taxonomy (4 Credits)
Plant Taxonomy is the study of the diversity of plants and their identification, nomenclature, classification and evolution. Activities include field collection and the preparation of a herbarium.
**Pre-require(s):** BIOL 130 Principles of Biology I, BIOL 131 Principles of Biology II, BIOL 233 Principles of Botany

BIOL 311 Pathophysiology (3 Credits)
This course is designed to introduce the student to pathophysiologic concepts related to altered biological processes affecting individuals across the lifespan and is built on the general principles of health maintenance. A global approach to disease will be emphasized. The course builds on principles from anatomy, physiology, and chemistry.
**Co-require(s):** NURS 300 Contemporary Professional Nursing; NURS 303 Information and Technology in Nursing Practice; NURS 304 Health Assessment; NURS 305 Fundamentals of Nursing and NURS 466 Cultural Paradigms.

BIOL 312 Endocrinology (3 Credits)

BIOL 330 Pre Professional Internship (2 Credits)

BIOL 332 Field Ecology (4 Credits)
This course is a comparative community ecology course which includes a one week field trip. Students will learn about the ecological factors responsible for the control and dynamics of the plant and animal communities in the Appalachian Mountains. Emphasis is on field study of the biotic communities in the Appalachian Mountains. A field fee is required for this course. Lecture/Recitation/Laboratory/Field Trip.
**Pre-require(s):** BIOL 130, BIOL 131, BIOL 230, CHEM 106, and CHEM 1106.

BIOL 335 Essential Concepts in Neuroscience (3 Credits)
This course introduces essential concepts in neuroscience, ranging from cellular and molecular processes of neural function and communication, to neural systems, and the higher level processing underlying cognition and learning. The course will explore both anatomical and physiological processes through discussion, hands on laboratory demonstrations and analysis of foundational research literature.

BIOL 350 Biology Research (2 Credits)
This is a course individually designed to provide the undergraduate training in biological research. Students work on projects under the guidance and supervision of a faculty member. Written reports and a final paper are required.
**Pre-requisites:** Permission of instructor, permission of chairperson, and junior or senior status

BIOL 354 Professional Assistant (2 Credits)
This is an individual program arranged as a contract between student and professor. Working closely with the professor, students participate in various aspects of college teaching.
**Pre-require(s):** Permission of instructor, Permission of chairperson, and sophomore, junior or senior status

BIOL 401 Developmental Biology (4 Credits)
This course studies the fundamental concepts underlying the process of development in animals. Patterns and processes of early development as well as the mechanisms of cell differentiation are covered. Lecture/Recitation/Laboratory.
**Pre-require(s):** BIOL 230, BIOL 231, or BIOL 236, and CHEM 106, and CHEM 1106.

BIOL 402 Ecology (4 Credits)
This course deals with general ecological concepts relevant to all habitats. Emphasis is on field study of biotic communities in various habitats.
**Pre-require(s):** BIOL 230 and CHEM 106 and CHEM 1106 and INTD 180 or MATH 140 or MATH 190 or PSYC 230

BIOL 403 Radiation Biology (4 Credits)
This course studies the biological effects of ionizing radiations. Laboratories include work with radionuclides and the effects of radiation on plants and animals.
**Pre-require(s):** BIOL 130 Principles of Biology I, BIOL 131 Principles of Biology II, CHEM General Chemistry II, CHEM 1106 General Chemistry II, PHYS 130 College Physics I, CHEM 208 Organic Chemistry I also recommended

BIOL 404 Immunology (3 Credits)
This lecture course discusses the mammalian immune system and immune responses to infection, with particular emphasis on the human. An overview of immune cells, tissues and organs leads to a detailed discussion of the functions of each type of immune molecule and cell. The immune responses to infectious disease and cancer are examined.

BIOL 406 Molecular Genetics (4 Credits)
This course is an introduction to the basic principles and techniques of molecular genetics. Topics treated include the structure and functions of macromolecules and their interactions in diverse cellular systems, and the molecular mechanisms of gene regulation, recombination, repair and mutations. In the laboratory, basic techniques of recombinant DNA and gene cloning technology are used. Lecture/Recitation/Laboratory.
**Pre-require(s):** BIOL 130 Principles of Biology I, BIOL 131 Principles of Biology II, BIOL 304 Genetics, CHEM 208 Organic Chemistry I, CHEM 307 Biochemistry is also recommended
BIOL 407 Cell & Molecular Biology I (4 Credits)
This is a study of the form and function of prokaryotic and eukaryotic cells. The organization, physiology and reproduction of cells is examined. Laboratory experiences are designed to introduce classical and contemporary methods of cell study.
Pre-Requisite(s): BIOL 230 and BIOL 301 or BIOL 303 and CHEM 106 and CHEM 1106

BIOL 408 Cell & Molecular Biology II: Molecular Genetics (4 Credits)
This course examines the physical and biological properties of nucleic acids. DNA replication, gene expression, recombination, mutation and DNA repair are presented in lectures. The laboratory component introduces students to the basic techniques of recombinant DNA technology.
Pre-Requisite(s): BIOL 230 and BIOL 304 or CHEM 307 and CHEM 106 and CHEM 1106

BIOL 409 Biological Chemistry (3 Credits)
This course is an overview of the chemical basis of life, with emphasis on biochemical processes. The structures of biomolecules and their nutrient precursors are introduced. Enzymes, nutrient utilization and photosynthesis are considered. Lecture.
Pre-Requisite(s): BIOL 230 and BIOL 301 or BIOL 407 and CHEM 106 and CHEM 1106

BIOL 410 Electron Microscopy (4 Credits)
This course offers a study of the functioning of the electron microscope and its use in biological research. Laboratories include use of the instrument and related techniques.
Pre-Requisite(s): BIOL 230 and BIOL 303 or BIOL 305 and CHEM 106 and CHEM 1106

BIOL 418 Scanning Electron Microscopy (4 Credits)
This hands on course offers the theory and practical applications of Scanning Electron Microscopy (SEM) in biological research, especially in examining surface features of cells, tissues, and non-biological materials. Students will develop set of skills in SEM imaging and sample preparation.

BIOL 419 Transmission Electron Microscopy (4 Credits)
This hands on course offers the theory and practical applications of Transmission Electron Microscopy (TEM) in biological research, especially in examining cellular ultrastructure. Students will develop set of skills in TEM imaging and operation conditions to achieve optimum performance.
Pre-Requisite(s): BIOL 230; BIOL 303; or BIOL 305; CHEM 106 and 1106.

BIOL 430 Pre Professional Internship (3 Credits)

BIOL 440 Biology Seminar (1 Credit)
In group discussions, students select a current problem not covered in existing course offerings, build a hypothesis, evaluate evidences from other sources, and attempt a solution. Guest speakers and biology department members who have expertise in the topic under discussion participate. Course pre-requisite: Five Major Biology courses above 100 level.
Pre-Requisite(s): Five Biology Major Classes above 100 Level.

BIOL 450 Biology Research (3 Credits)
This is a course individually designed to provide the undergraduate training in biological research. Students work on projects under the guidance and supervision of a faculty member. Written reports and a final paper are required.
Pre-requisites: Permission of instructor, permission of chairperson, and junior or senior status