

# DEPARTMENT OF BIOLOGY

For those students who expect to major in biology, a high-quality education in the pure science of biology is provided that stresses the inherent importance of the discipline, promotes understanding of the scientific process, encourages participation in professions based on biological knowledge and technology, and fosters an awareness of biological concerns in areas not directly related to the biological sciences. Biology majors can pursue either a B.A. or B.S. degree in Biology. Those interested in the Medical Laboratory Science program at Jersey Shore University Medical Center (<https://www.hackensackmeridianhealth.org/en/Healthcare-Professionals/JSUMC/florence-m-cook-school-of-medical-laboratory-science/>) or the Medical Laboratory Science program at Monmouth Medical Center (<https://www.rwjbh.org/for-healthcare-professionals/medical-education/monmouth-medical-center/john-a-mihok-school-of-medical-laboratory-science/>) can pursue the Medical Laboratory Science Track in either the B.A. or B.S. degree in Biology.

For students who are interested in a specialized health-related career, one option is to pursue a B.S. degree in Clinical Laboratory Sciences or Medical Imaging Sciences, each with a minor in biology. These are joint-degree programs with Rutgers University. Students complete GCU's General Education and science courses at GCU. Application for admittance to one of the three Rutgers University professional career programs below occurs during the third year of pre-professional coursework at GCU. Students complete the professional career program courses at Rutgers University. Upon completion of the Rutgers University program, the bachelor's degree is awarded jointly by both institutions.

1. Cardiovascular Sonography, or Echocardiography (use of ultrasound imaging and other techniques to view the cardiovascular anatomy, diagnose cardiovascular conditions, and detect diseases and abnormalities such as aneurysms of the blood vessels)
2. Diagnostic Medical Sonography (use of ultrasound for diagnosis including sonograms to study the fetus as it develops in the mother) or
3. Medical Laboratory Science, formerly called Medical Technology (perform clinical laboratory tests that provide laboratory data critical to the diagnosis, treatment and monitoring of disease)

Along with over 20 other New Jersey colleges and universities, GCU is a member of the New Jersey Marine Sciences Consortium (NJMSC), a nonprofit group dedicated to the understanding and wise utilization of New Jersey's marine resources. Each summer, the NJMSC offers courses in the marine sciences, mostly at Sandy Hook, New Jersey. Students may register for these courses for credit through Georgian Court. GCU considers the courses equivalent to transfer courses. Students should check with their advisor to learn which courses are considered biology courses prior to registering for a course.

For students who do not expect to specialize in the sciences, the Department of Biology offers instruction that provides insight into science as a way of knowing and communicates the major ideas of biology. Emphasis is on the significance of basic biological principles as they relate to specific social issues that currently confront humankind. Population growth, protection of the environment, and the use of genetic engineering to modify living organisms are some of the topics addressed in biology courses specifically designed for the non-science student.

For information about special partnerships in medicine, pharmacy, and physical therapy, see Partnerships & Preparation for Careers in

Engineering, Law, & Health Related Fields (<http://catalog.georgian.edu/undergraduate/academic-programs/preparation-careers-engineering-law-medicine-pharmacy-physical-therapy/>).

## Departmental Honors: Biology

Students who meet the following requirements will graduate with a B.S. in Biology, with honors in biology:

- Minimum biology GPA of 3.5;
- Completion of at least 8 elective credits of biology course work at the 300 or 400 level, excluding BI404 Internship in Biology I, BI405 Internship in Biology II, BI425 Independent Study in Biology, BI446 Research Problem in Biology I, and BI447 Research Problem in Biology II; and
- Completion of either Option 1 or Option 2 as follows.
  - **Option 1:** Completion of 6 credits of BI446 Research Problem in Biology I; BI447 Research Problem in Biology II, culminating in a written paper and an oral presentation in a forum open to the public (e.g., GCU Academic Excellence Celebration, Beta Beta Beta District Meeting, New Jersey Academy of Science Annual Meeting).
  - **Option 2:** Completion of 4 credits of BI446 Research Problem in Biology I; BI447 Research Problem in Biology II, culminating in a written paper and an oral presentation in a forum open to the public (e.g., GCU Academic Excellence Celebration, Beta Beta Beta District Meeting, New Jersey Academy of Science Annual Meeting) and completion of 2 credits of BI404 Internship in Biology I or BI405 Internship in Biology II culminating in a term paper and oral presentation of the internship experience.

## Medical Imaging Sciences & Clinical Laboratory Sciences Majors with a Minor in Biology

These are joint degree programs with the Rutgers University School of Health Professions in Newark and Scotch Plains. At GCU, students take a specific set of science courses leading to a minor in biology, and complete the general education (physical education, humanities and social sciences) requirements at GCU. This typically adds up to a total of 85 or more GCU credits depending on the student's choice of program. In the fall of the junior year (consult with advisor and Rutgers University website for deadline date), the student applies to the Rutgers University's School of Health Professions. For the B.S. in Medical Imaging Sciences, the student chooses one of the following specialties: cardiovascular sonography (<https://shp.rutgers.edu/clinical-lab-and-imaging-sciences/bachelor-of-science-cardiac-sonography/>) or diagnostic medical sonography. (<https://shp.rutgers.edu/clinical-lab-and-imaging-sciences/bachelor-of-science-diagnostic-medical-sonography/>) For the B.S. in Clinical Laboratory Sciences, the student specializes in medical laboratory science (<https://shp.rutgers.edu/clinical-lab-and-imaging-sciences/bachelor-of-science-medical-laboratory-sciences/>). If accepted, the student spends 15 to 18 months taking the specialized courses (45–50 credits) in the field of study. At the conclusion of the period of study at Rutgers University, the student earns a Bachelor of Science in Clinical Laboratory Sciences with a minor in biology, or a Bachelor of Science in Medical Imaging Sciences with a minor in biology, jointly awarded by GCU and Rutgers University. GCU does not guarantee acceptance into any Rutgers University program. Rutgers University generally expects applicants to have earned no grade lower than a C in the required science courses (for the Medical Imaging Sciences programs, applicants must

earn a grade no lower than B- in BI213 Human Anatomy & Physiology I and BI214 Human Anatomy & Physiology II) and to have a minimum GPA of at least 2.85 (requirements subject to change). Meeting or exceeding the minimum GPA does not guarantee acceptance into the Rutgers University program. Some Rutgers University courses are taught online.

## Course Advisement

Individualized, semester-by-semester course advisement is available for all students based on their career interests. For example, students interested in medicine will follow a pre-medical, pre-veterinary, or pre-dental curriculum. Students should discuss course selection with their advisor to be certain they complete the appropriate courses to prepare them for their career goal. Recent graduates have entered medical, dental, and veterinary schools, masters and doctoral programs in biological sciences, allied health programs, pre-college teaching, and careers in industry, government, and nonprofit organizations.

## Medicine, Dentistry, or Veterinary Medicine

Students may obtain a B.S. in Biology to prepare them for medical, dental, or veterinary school. The B.A. in Biology is not an appropriate program for pre-professional students as the course requirements do not meet the entrance requirements for most professional schools. The student should become familiar with the specific requirements of the professional school(s) of their choice and use this knowledge, along with department advisement, to select courses. In addition to the core of required courses for the B.S. degree, the department strongly recommends the following courses:

Code	Title	Credits
<b>Recommended Courses</b>		
BI213	Human Anatomy & Physiology I <sup>1</sup>	4.0
BI214	Human Anatomy & Physiology II <sup>1</sup>	4.0
BI437	Biochemistry I <sup>1</sup>	4.0
BI438	Biochemistry II <sup>1</sup>	4.0
BI219	Microbiology	4.0
BI407	Neurobiology	4.0
BI427	Immunology	4.0

<sup>1</sup> Strongly recommended.

Pre-professional students should take their professional school admission test during their junior year.

## Medical Laboratory Science at Jersey Shore University Medical Center & Monmouth Medical Center

Students follow the designated Medical Laboratory Science Track program in biology at Georgian Court for three years, following the recommendations of the American Society of Clinical Pathology. This program includes the required biology, chemistry, physics and mathematics courses for a B.A. or B.S. in Biology degree plus, as biology electives, certain courses that prepare the student for the medical technology program. For the fourth year, students take courses in medical technology at an affiliated hospital, and receive Georgian Court biology credit for those courses by registering for BI401 Medical Technology Internship I and BI402 Medical Technical Internship II at

Georgian Court. At the completion of the fourth year, students receive a B.A. or B.S. in biology from Georgian Court. Students must have a minimum cumulative GPA of 2.8. After passing a nationally administered examination, they become registered Medical Technologists (MT-ASCP).

Application for admission to medical technology programs takes place during the junior year. Georgian Court is affiliated with the Jersey Shore University Medical Center (Neptune, New Jersey) and Monmouth Medical Center (Long Branch, New Jersey). Students are responsible for applying to the program of their choice. Georgian Court does not guarantee acceptance into a program. Students wishing to complete four years at Georgian Court may also apply to nonaffiliated medical centers.

For curricula at Rutgers University's School of Health Professions for the Clinical Laboratory Sciences and Medical Imaging Sciences majors, see the individual program webpages at the Rutgers University School of Health Professions website at <https://shp.rutgers.edu/programs/>.

## New Jersey Teaching Credentials

The New Jersey certifications below are available for students earning the B.A. in Biology or B.S. in Biology:

- Early Childhood Education (P–3) with Teacher of Students with Disabilities Endorsement
- Elementary Education (K–6) with Teacher of Students with Disabilities Endorsement, & with option for Middle School Science Endorsement
- Teacher of Biology (K–12) with Teacher of Students with Disabilities Endorsement
- Teacher of English as a Second Language (ESL) with Teacher of Students with Disabilities Endorsement

For required professional courses in education, please refer to the Education (<http://catalog.georgian.edu/undergraduate/school-education/>) section of the catalog.

## Programs Majors

- Biology, B.A. (<http://catalog.georgian.edu/undergraduate/school-arts-sciences/biology/biology-ba/>)
- Biology, B.S. (<http://catalog.georgian.edu/undergraduate/school-arts-sciences/biology/biology-bs/>)
- Clinical Laboratory Sciences, B.S. (<http://catalog.georgian.edu/undergraduate/school-arts-sciences/biology/clinical-laboratory-sciences-bs/>)
- Medical Imaging Sciences, B.S. (<http://catalog.georgian.edu/undergraduate/school-arts-sciences/biology/medical-imaging-sciences-bs/>)

## Minors

- Biology, Minor (<http://catalog.georgian.edu/undergraduate/school-arts-sciences/biology/biology-minor/>)

## Courses Biology (BI)

### **BI109 Environmental Biology (4.0 Credits)**

Environmental Biology is a course concerned with the past, present, and future of life on earth, from the beginning of the universe through human civilization. Emphasis will be placed on understanding the major principles of the science of ecology and the environment, and students will gain a deepened appreciation for the interdependence and interrelatedness of all living organisms. This knowledge will be used to assess current and future issues arising from human use and degradation of natural resources. The principles of sustainability will be woven through the analysis of earth's support systems and current environmental issues to provide a path forward for future generations. 3 hours lecture, 3 hours laboratory.

### **BI111 Life: Human Biology (4.0 Credits)**

Life: Human Biology provides students an overview of the anatomy and physiology of the human body. Students will gain an understanding and appreciation of the elegant molecular mechanisms that underlie human genetics and reproduction, and learn the essential facts of the structure and function of the eleven organ systems that comprise the human body. Students may not take BI111 (or equivalent transfer courses) for biology major credit after completing more than 8 credits of biology courses. Students may not take BI111 (or equivalent transfer course) for credit after completion of BI213 Human Anatomy and Physiology I or BI214 Human Anatomy and Physiology II. 3 hours lecture, 3 hours laboratory. Offered each year.

### **BI120 Biological Diversity & Phylogeny (4.0 Credits)**

This course will focus on life itself, unified and diverse, interactive and evolving as it is experienced through life forms in the Sister Mary Grace Burns Arboretum at Georgian Court University. With the tools of science, students will observe and collect organisms for study; become familiar with the characteristics common to all life; discover the ways in which diverse species have responded to the challenges of surviving and reproducing on a rocky/watery planet. Attention will be given to history, geology, and continually changing Earth as life's source and substance, and life's role in shaping the planet and its own future. Readings, multimedia presentations, and online resources will supplement the required text. Questions arising from activities will fuel class discussion and lead to original investigations. Creative as well as standard laboratory projects will aid in the assessment of learning. This course is intended for biology majors. 3 hours lecture, 3 hours laboratory.

### **BI121 Cellular Organiz., Energetics & Function (4.0 Credits)**

This course will focus on the characteristics shared by all living organisms. Topics include tissue structure and organization, the structure and function of biological molecules, cell organization, and cellular energies. Laboratory exercises are designed to require the application of concepts presented in lectures/readings, promote understanding and appreciation for the scientific method of inquiry, and support the acquisition of basic laboratory skills necessary to function in a modern biology laboratory. Presupposes an elementary knowledge of chemistry. Must be completed before taking many biology courses. Designed for biology majors and minors. 3 hours lecture, 3 hours laboratory.

### **BI201 Biological Literature (1.0 Credits)**

This course introduces the biology major to the main reference books, journals and indexes used in biological research. It also prepares the student to do independent research projects using computer-based literature searches. Offered each fall.

Prerequisite(s): BI120, BI121, BI204, or 4 other biology credits.

### **BI203 Experimental Design & Statistics (3.0 Credits)**

A practical overview of scientific investigation with emphasis on a unified process of experimental design, hypothesis testing and data analysis. A variety of descriptive measures and statistical techniques, both parametric and non-parametric, are presented from the standpoint of their appropriateness to the context of the data. Proficiency in the use of computer software for data analysis and display is a major goal of the course and is emphasized throughout. Offered each fall.

Prerequisite(s): Completion of any of the following courses: PH112, PH122, CH112, CH114, BI111, or BI121.

### **BI204 Genetics & Evolution (4.0 Credits)**

This course is intended for students majoring in biology or other natural science. Topics include chromosome structure, meiosis and cell cycle, fundamental concepts in classic Mendelian genetics, gene regulation, population genetics, and evolution. Theories on the origin of life will also be introduced. Designed for biology majors and minors. 3 hours lecture, 3 hours laboratory.

Prerequisite(s): BI121.

### **BI213 Human Anatomy & Physiology I (4.0 Credits)**

A study of the organ systems of the human body. Topics include musculoskeletal, neuroendocrine, cardiovascular, digestive, respiratory, renal and reproductive systems, and includes dissection and use of prosected models. Designed for premedical, nursing, exercise science, pre-nursing, allied health and medical technology students. 3 hours lecture, 3 hours laboratory. Offered each year.

### **BI214 Human Anatomy & Physiology II (4.0 Credits)**

A study of the organ systems of the human body. Topics include musculoskeletal, neuroendocrine, cardiovascular, digestive, respiratory, renal and reproductive systems, and includes dissection and use of prosected models. Designed for premedical, nursing, exercise science, pre-nursing, allied health and medical technology students. 3 hours lecture, 3 hours laboratory. Offered each year.

Prerequisite(s): BI213.

### **BI219 Microbiology (4.0 Credits)**

A study of the morphology, classification, growth, physiology, biochemistry and genetics of microorganisms. Microbe-host interactions as well as basic principles of applied microbiology are also studied. 3 hours lecture, 3 hours laboratory. Offered each year.

Prerequisite(s): Two semesters of biology and one semester of chemistry, or permission of chairperson.

**BI275 Pathophysiology (3.0 Credits)**

This course introduces the students to basic concepts in pathophysiology as applied in current nursing practice. It builds on previous foundations in the biological sciences and focuses on the integration of pathophysiological with the principles of the nursing process. It introduces students to pathophysiological disturbances to normal body functions emphasizing differences in etiology, epidemiology, pathophysiology, clinical manifestations and treatments in individuals across the lifespan. The student will analyze objective and subjective manifestations of common health problems resulting from environmental, genetic and stress related conditions. Diagnostic testing, interventions and pharmacological treatments and related nursing implications are discussed as they relate to specific health problems. 3 hours lecture. This course is cross-listed with ES275 and NU275.

Prerequisite(s): BI213, BI214, and either NU111 or permission of the Nursing Department Chair.

**BI276 Marine Biology (4.0 Credits)**

This course is designed for the student majoring in biology, marine studies, or ecology. Through classroom and laboratory experiences, the student will be able to identify the environmental parameters of marine habitats and their effect on the distribution of marine flora and fauna. Students will collect and identify numerous representatives of local marine forms, both in the laboratory and in field settings. The student will also demonstrate proficiency in the utilization of various types of equipment used to complete such tasks and demonstrate knowledge of the anatomy, physiology, and behavior of marine organisms.

Prerequisite(s): BI109 or BI120.

**BI305 Biological Interactions: Ecology (4.0 Credits)**

Biological systems are characterized by interactions at all levels of organization from molecular to global scales. This course will provide students with the opportunity to build on and integrate the knowledge they have gained in previous science courses by researching a variety of interactions within and between cells, organisms, and ecosystems. It also emphasizes inquiry-based, collaborative learning and development of real-world problem-solving skills. Designed for biology majors and minors and for students in the Natural Sciences. 3 hours lecture, 3 hours laboratory. Students cannot take this course for credit if they have already earned credit for BI310.

Prerequisite(s): BI120, and one or more of the following: BI111, BI121, or BI204.

**BI310 Ecology & Health (3.0 Credits)**

Humans are the dominant species on Earth and their rapidly growing population is changing the biosphere in ways that are profound and often have unknown or unexpected consequences. The study of ecology is key to understanding the multiple feedbacks through which our activities affect both human health and the health of all living things on this planet. In this course, the fundamental principles of ecology, from population to ecosystem and biosphere levels, will be examined through the lens of human health and health care needs and issues. Topics studied will include factors affecting population growth and carrying capacity, competition, mutualism, predator prey dynamics, ecosystem processes, and biosphere level connections. Students cannot take this course for credit if they have already earned credit for BI305.

Prerequisite(s): BI109 or BI120, and at least one other 3-to 4-credit biology course.

**BI320 Cell Biology (4.0 Credits)**

This course aims to provide the student an understanding of the molecular biology of the eukaryotic cell and promote an appreciation of the "social nature" of this cell as it cooperates and communicates with other cells and specializes its function within the body of a multicellular organism. 3 hours lecture, 3 hours laboratory. Offered as needed.

Prerequisite(s): BI121, BI204, CH113, and CH114, or permission of chairperson.

**BI324 Botany (4.0 Credits)**

A study of the morphology, physiology, evolution and taxonomy of plants. Fungi and autotrophic protists and prokaryotes are introduced. 3 hours lecture, 3 hours laboratory or field work. Offered as needed.

Prerequisite(s): BI111, or BI120 and BI121.

**BI325 Animals and Parasites (4.0 Credits)**

Invertebrates make up over 95% of all animal life on our planet, with over 2 million species having been described and placed in more than 33 phyla. They are food for humans and other animals, they cause disease, they pollinate most of the plants we need and use, they affect global climate, some are important with respect to medicine, etc. All people, but especially biologists, need to have a good working knowledge of invertebrates. This course is intended to provide students with an overview of the animal-like protists and of the Invertebrate Phyla within Kingdom Animalia, with a heavy focus on the latter. The evolutionary and phylogenetic relationships between these organisms will be used as a foundation from which to study animal structure and physiology. The goal of this course is both to introduce students to the diversity of life on this planet and to stimulate an appreciation of invertebrates and their remarkable evolutionary innovations. 3 hours lecture, 3 hours laboratory. Offered as needed.

Prerequisite(s): BI109 and BI111, or BI120 and BI121.

**BI327 Special Topics in Biology (3.0 Credits)**

A course that addresses an advanced topic in biology. Lecture and/or lab for 1 to 4 credits. Offered with approval of the dean.

Prerequisite(s): Permission of the chairperson.

**BI331 Comparative Vertebrate Anatomy (4.0 Credits)**

A comparative study of the anatomy of representative vertebrates, which aims to demonstrate the role of evolution in the interrelationships of the vertebrates at all levels of organization. 2 hours lecture, 4 hours laboratory. Offered as needed.

Prerequisite(s): BI111, or BI120 and BI121.

**BI360 Environmental Sustainability (3.0 Credits)**

Develop critical thinking skills and evaluate information about the impact that current "Western" lifestyles and population trends have on the attainment of a sustainable environment. Investigate the goods and services provided to humans by nature and the impacts of human activities on nature's ability to provide these benefits. Analyze specific environmental issues related to sustainability and reflect upon how and to what extent our individual and collective behaviors impact the problems. Explore possible solutions that can be employed, both personally and societally, including insights gained from the ways in which non-Western societies relate to one another and to the environment. Consider the ethical dilemmas generated by humans as consumers and the value of promoting social justice, respect for rights of humans, non-human organisms and the environment, and a commitment to action and care for others.

Prerequisite(s): BI109 or BI120.

**BI361 Tropical Ecology (3.0 Credits)**

This course will provide students with a broad overview of both terrestrial and aquatic tropical ecosystems. Students will gain insight into basic ecological concepts and will learn about a variety of tropical biomes and the numerous complex ecological interactions found in these areas. A number of case studies will also be used to investigate the specific applications of general ecological concepts in the context of tropical ecosystems. May be taken without the accompanying lab, BI362, which includes a travel abroad component. However, taking BI362 concurrently with this lecture is strongly recommended.

Prerequisite(s): A minimum of 8 credits of biology, including either BI109 or BI120.

**BI362 Tropical Ecology Laboratory (1.0 Credits)**

This laboratory accompanies BI361 Tropical Ecology Lecture and must be taken concurrent with that course. Students will experience a tropical ecosystem first hand during a travel abroad experience. In addition to multiple opportunities to connect the learning in lecture with real-life examples, students will carry out an original research project testing a hypothesis relating to concepts learned in the associated lecture.

Prerequisite(s): A minimum of 8 credits of biology, including either BI109 or BI120.

Corequisite(s): BI361.

**BI363 Medical Anatomy & Physiology I (4.0 Credits)**

Students learn about human anatomy and physiological processes with emphasis on how systems interact with each other and the pathologies that can occur. Students will gain knowledge of the organ systems. Lab exercises will include the use of plastic and animal models for macroscopic identification of organs. Students will learn how to use the microscope, which will be used for histology. Students will gain dissection and clinical examination skills. Students will learn the science behind the diagnosis and treatment of disorders of the human body. Students cannot take this course for credit if they have already earned credit for BI213.

Prerequisite(s): BI121.

**BI364 Medical Anatomy & Physiology II (4.0 Credits)**

Students learn about human anatomy and physiological processes with emphasis on how systems interact with each other and the pathologies that can occur. Students will gain knowledge of the organ systems. Lab exercises will include the use of plastic and animal models for macroscopic identification of organs. Students will learn how to use the microscope, which will be used for histology. Students will gain dissection and clinical examination skills and learn the science behind the diagnosis and treatment of disorders of the human body. Students cannot take this course for credit if they have already earned credit for BI214.

Prerequisite(s): BI363.

**BI401 Medical Technology Internship I (16.0 Credits)**

First semester of a one-year program at an affiliated hospital. Instruction and clinical experience in blood banking, microbiology, hematology, clinical chemistry, parasitology, immunology, serology, pathology and nuclear medicine.

**BI402 Medical Technical Internship II (16.0 Credits)**

Second semester of a one-year program at an affiliated hospital. Instruction and clinical experience in blood banking, microbiology, hematology, clinical chemistry, parasitology, immunology, serology, pathology and nuclear medicine.

Prerequisite(s): BI401.

**BI404 Internship in Biology I (2.0 Credits)**

Biology-related work experience in corporations involved in various aspects of the health and science fields. Six hours per week, 2 credits each semester. Limited to seniors.

Prerequisite(s): Permission of chairperson.

**BI405 Internship in Biology II (2.0 Credits)**

Biology-related work experience in corporations involved in various aspects of the health and science fields. Six hours per week, 2 credits each semester. Limited to seniors.

Prerequisite(s): BI404.

**BI407 Neurobiology (4.0 Credits)**

An investigation of the structure and function of the central nervous system and the major sensory systems. Emphasis will be placed on the study of the brain: its development, current concepts related to the chemical and electrical phenomena of its neurons and the interaction of neurons in memory and learning. 3 hours lecture, 3 hours laboratory. Offered as needed.

Prerequisite(s): BI121, BI204, CH113, and CH114, or permission of chairperson.

**BI411 Tissue Culture (3.0 Credits)**

This course will provide students with experience in both plant and animal tissue culture technologies, including aseptic technique, use of tissue culture equipment, and typical cell culture assays. Focus will be on students learning how to grow, maintain, and characterize healthy mammalian cell cultures. 1 hour lecture, 4 hours laboratory. Offered as needed.

Prerequisite(s): BI121 and BI204, or permission of instructor.

**BI419 Advanced Microbiology (4.0 Credits)**

This course delves deeper into concepts of microorganisms, beyond just the health care industry aspects. Students will be able to understand the significance of microbial anatomy, metabolic processes, and advanced genetics. They will then be able to apply these basic microbiology concepts to more real-world applicable analyses of microbial significance in biotechnology, ecology, symbioses, pathogenesis, epidemiology, and diagnostics. Students will further reinforce their understanding of microbial concepts through a series of hands-on laboratory experiments including, but not limited to, microscopy, aseptic technique, staining, viral plaque estimation, soil/water analyses, biochemical fingerprinting, and genetic engineering. Enrollment requirements: Only a maximum of two microbiology courses count toward a biology degree; no student may take a 200-level microbiology course after any 300- or 400-level microbiology course. 3 hours lecture, 3 hours laboratory.

Prerequisite(s): BI219 or BI204.

**BI420 WI:Medical Microbiology (4.0 Credits)**

In this writing intensive course, students delve into the intricacies of microbial interactions with an emphasis on body systems and clinical practices. Students will explore the most common pathogens in the medical field, examining symptoms, diagnoses, and treatments of infectious diseases. Laboratory exercises will include analyzing case studies to identify treatment of patients, staining to diagnose tuberculosis and other common infections, developing treatment plans for infected patients, and exploring microbes in various other hands-on exercises. Enrollment requirements: Only a maximum of two microbiology courses count toward a biology degree; no student may take a 200-level microbiology course after any 300- or 400-level microbiology course. 3 hours lecture, 3 hours laboratory.

Prerequisite(s): BI219 or BI204.

**BI422 Advanced Molecular Genetics (4.0 Credits)**

A study of concepts in advanced molecular genetics including mapping and sequencing genomes, RNA synthesis and processing, RNA interference, and molecular phylogenetics. Laboratory exercises will complement class topics and include 3 multiweek projects emphasizing critical reasoning and the scientific method. 3 hours lecture, 3 hours laboratory. Offered as needed.

Prerequisite(s): BI121 and BI204.

**BI425 Independent Study in Biology (2.0 Credits)**

This course gives the student the opportunity to pursue a topic of special interest in biology under the guidance of a faculty member. The topic to be investigated must be one that is unavailable to the student through the regular curriculum. Offered on application.

Prerequisite(s): Permission of chairperson.

**BI427 Immunology (4.0 Credits)**

A study of concepts in immunology including humoral and cell-mediated response systems, immune cell function, antigen recognition, nonspecific host defense systems and disorders of the immune system. Laboratory exercises will emphasize application and analysis of concepts covered in lectures and readings. Students may not take BI427 for credit after completing BI428. Offered as needed.

Prerequisite(s): BI121 and BI204, or permission of chairperson.

**BI428 Fundamentals of Immunology (3.0 Credits)**

A study of concepts in immunology including humoral and cell-mediated response systems, immune cell function, antigen recognition, nonspecific host defense systems and disorders of the immune system. Students may not take BI428 for credit after completing BI427. Offered as needed.

Prerequisite(s): BI121 and BI204, or permission of chairperson.

**BI437 Biochemistry I (4.0 Credits)**

The first course of a two semester sequence (CH311, CH312), this course provides an introduction to the chemistry of macromolecules in biological systems including the structure and function of proteins, carbohydrates, lipids, and nucleic acids; catalytic and regulatory strategies of enzymes, membrane structure, and signal transduction. 3 hours lecture, 3 hours laboratory. Offered each fall. This course is cross-listed with CH311.

Prerequisite(s): CH224.

**BI438 Biochemistry II (4.0 Credits)**

Building on the introduction to the chemistry of biological macromolecules (CH311), this course focuses on the metabolism of carbohydrates (including glycolysis, gluconeogenesis, pentose phosphate pathway, glycogen synthesis and degradation, the citric acid cycle, and oxidative phosphorylation), lipids, amino acids and nucleic acids, and Gene replication and expression: DNA structure, replication and repair; RNA synthesis and splicing; control of gene expression in prokaryotes and eukaryotes. 3 hours lecture, 3 hours laboratory. Offered each spring. This course is cross-listed with CH312.

Prerequisite(s): CH311.

**BI443 Capstone in Biology: BA (2.0 Credits)**

This course provides students in the B.A. in Biology a unifying, culminating experience in their major field. Students are challenged to use and extend intellectual skills and knowledge of biology acquired throughout their undergraduate training to research and develop a deep knowledge of a topic of their choice, and to prepare both a review paper and an oral presentation on that subject. Students will also learn how to interpret the reported outcomes of various common statistical tests and reporting methods in science. As a requirement for successful completion of the course, students will complete the Major Field Test.

Prerequisite(s): Completion of 21 biology credits (including BI201).

**BI444 Capstone in Biology: BS (2.0 Credits)**

This course provides advanced students a unifying, culminating experience in biology. Students are challenged to use and extend intellectual skills and knowledge of biology acquired throughout the undergraduate program. As a requirement for successful completion of the course, students will complete the Major Field Test. Offered each spring.

Prerequisite(s): completion of 24 biology credits (including BI201 and BI203) or permission of the chairperson.

**BI446 Research Problem in Biology I (1.0 Credits)**

One or two semesters; 1–3 credits per semester. Hours and credits to be arranged with research mentor. A student may earn no more than 6 credits of BI446, 447 total.

Prerequisite(s): Completion of 16 biology credits.

**BI447 Research Problem in Biology II (1.0 Credits)**

One or two semesters; 1–3 credits per semester. Hours and credits to be arranged with research mentor. A student may earn no more than 6 credits of BI446, 447 total.

Prerequisite(s): Completion of BI446.

**BI450 Animal Behavior (4.0 Credits)**

This course will introduce students to the ways that the evolutionary forces of natural selection and sexual selection have shaped the behaviors of animals. Major topics considered include foraging behavior, learning and cognition, communication, anti-predator behavior, parental care and reproductive tactics, mating systems, and social behavior. Using case studies, field trips, and assorted media, students will both learn and apply a variety of methods used to understand the behavior of organisms across m and beyond. 3 hours lecture, 3 hours laboratory.

Prerequisite(s): A minimum of 12 credits of biology, including BI109 or BI120; recommended: completion of BI203 and/or BI305.

**BI490 Developmental Biology (4.0 Credits)**

This course provides advanced instruction in the study of modern developmental biology. It requires that the interested student have a strong foundation in genetics, cell and molecular biology, and organismal biology. Through lecture/discussion, reading of the primary and secondary literature, and well-designed laboratory experiences using “model” organisms typically encountered in the modern study of animal development, this course will offer students opportunity to gain familiarity with modern analysis of developmental processes, and an understanding of the mechanisms that underlie animal development. 3 hours lecture, 3 hours laboratory. Offered as needed.

Prerequisite(s): BI121 and BI204.

For descriptions of courses taught at Rutgers University by Rutgers University faculty members, please visit <http://shrp.rutgers.edu>

For curriculum at Rutgers University's School of Health Professions for the Clinical Laboratory Sciences and Medical Imaging Sciences majors, see the Rutgers University website at <http://shrp.rutgers.edu/affiliates/georgiancourt.html>

## Faculty

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