

BIOLOGY B.S. / BIOLOGY B.A.

Program Overview

Rider's biology major educates the next generation of scientists by providing students with a foundation in the life sciences that prepares them to join the workforce or attend professional or graduate school.

Rider achieves this through small class and laboratory sizes allowing direct, hands-on instruction, and faculty accessibility. Students also have opportunities to do research with faculty via work study or independent study. Each student is assigned a faculty advisor who provides academic advice and career guidance tailored to the student's needs. Areas of professional and graduate study pursued by students in this major include medical, dental, and veterinary school; allied health programs such as optometry, podiatry, physical therapy, occupational therapy and nursing; programs leading to M.S. or Ph.D. degrees in the life sciences; and programs in science education.

Graduates of the biology program have pursued their graduate studies at prestigious institutions such as John Hopkins University, Cornell University, Princeton University, University of North Carolina at Chapel Hill, University of Pennsylvania, Harvard University, Dartmouth College and The Scripps Research Institute, among others.

Bachelor of Science Curriculum Overview

The curriculum for biology majors is structured to prepare students for a life of learning in the sciences. Students are expected to master content, develop technical skills, analytical skills and competency in oral and written communication. Foundational courses in biology, chemistry, physics and mathematics prepare students for the rigor of upper-level courses in microbiology, evolutionary biology, developmental biology, immunology, physiology, plant biology, ecology and neurobiology. Capstone seminars allow students to explore one area of the life sciences in depth through exploration and analysis of original scientific literature. Rider's science faculty are research-oriented and encourage students to take advantage of opportunities to engage in independent research. Students also have the opportunity to take part in a three-week internship course through the Capital Health System Hospitals, summer research and other off-campus internships.

Bachelor of Arts Option

The curriculum described above is for a Bachelor of Science program.

All students admitted to the College of Arts and Sciences seeking a biology degree will be enrolled in the B.S. program consisting of 62-63 credits. However, there is the option to be enrolled in a Bachelor of Arts program in biology. This program consists of 52 credits in the major and is designed for students who may desire a biology degree, but do not have a full eight semesters to commit to the program. Such students may be those enrolled in the College of Education and Human Services, transfer students or students choosing a second major. However, students may not choose to double-major in the B.A. program in biology and a closely-related B.S. program such as Behavioral Neuroscience or Health Science.

Students seeking to enroll in the Bachelor of Arts program in Biology must consult with the Chair of the Department of Biology and Behavioral Neuroscience before being considered for this program.

Student Learning Outcomes

Graduates of the Biology major will be able to:

1. Explain foundational concepts in biological sciences.
2. Apply scientific methods of inquiry through testing of newly formed hypotheses with observation and experimentation.
3. Apply concepts from other disciplines in the analysis and interpretation of biological information.
4. Demonstrate the ability to locate, critically analyze, and communicate relevant scientific information.
5. Explain the ethical practice of scientific research and its societal applications.

Honors Programs

Honors in Biology

The objective of the honors program in biology is to introduce talented undergraduate majors to the methods of basic research in the biological sciences. For consideration a student must have a 3.25 average at the end of their junior year. In the senior year, participating students must complete an independent research project and present a written honors thesis. At graduation a student who has a 3.25 cumulative average, a 3.5 average in biology courses, and who has completed an acceptable honors thesis will be awarded Honors in Biology.

Pre-medical, Pre-Dental, Pre-Veterinary and Pre-allied Health Advising Programs

In addition to their academic advisor, students pursuing medical, dental or veterinary school or pre-allied health programs upon graduation from Rider are encouraged to also consult with the department's pre-medical studies advisor. The pre-medical studies advisor is a faculty member who assists pre-medical, pre-dental, pre-veterinary students and pre-allied health students with academic and extra-curricular planning required to become competitive applicants for programs in the health professions.

The Biology curriculum helps pre-medical studies students prepare for the MCAT (Medical College Admission Test) by covering topics included on the MCAT.

Rider and Thomas Jefferson University have a long-standing articulation agreement for students who wish to pursue training in the allied health professions. This agreement does not guarantee admission of Rider students into Jefferson's programs; it does mean that Rider faculty members are familiar with Jefferson's academic requirements and that Rider's courses are eligible for transfer to Jefferson.

Rider University offers students with baccalaureate degrees the opportunity to take the undergraduate science course prerequisites for medical, dental, veterinary or graduate school. For more information, visit the Premedical Studies (<https://www.rider.edu/academics/colleges-schools/college-liberal-arts-sciences/programs-opportunities/pre-med/>) page.

Degree Offered

- B.S. in Biology
- B.A. in Biology
- Minor in Biology

Contact

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Program Website: Biology B.S./B.A. (<https://www.rider.edu/academics/colleges-schools/college-arts-sciences/science-technology-math/undergraduate/biology/>)

Associated Department: Department of Biology and Behavioral Neuroscience (<https://www.rider.edu/academics/colleges-schools/college-arts-sciences/science-technology-math/faculty-departments/biology-behavioral-neuroscience-health/>)

Related Programs

- Behavioral Neuroscience (<http://catalog.rider.edu/undergraduate/colleges-schools/arts-sciences/majors-minors-certificates/behavioral-neuroscience/>)
- Biochemistry (<http://catalog.rider.edu/undergraduate/colleges-schools/arts-sciences/majors-minors-certificates/biochemistry/>)
- Chemistry (<http://catalog.rider.edu/undergraduate/colleges-schools/arts-sciences/majors-minors-certificates/chemistry/>)
- Environmental Science (<http://catalog.rider.edu/undergraduate/colleges-schools/arts-sciences/majors-minors-certificates/environmental-sciences/>)
- Health Sciences (<http://catalog.rider.edu/undergraduate/colleges-schools/arts-sciences/majors-minors-certificates/healthsciencesbs/>)
- Mathematics (<http://catalog.rider.edu/undergraduate/colleges-schools/arts-sciences/majors-minors-certificates/mathematics/>)

Requirements for the Major

All students admitted to the College of Arts and Sciences seeking a biology degree will be enrolled in the Bachelor of Science (B.S.) program consisting of 62-63 credits. However, there is an option to be enrolled in a Bachelor of Arts (B.A.) program in biology. This program consists of 52 credits in the major and is designed for students who may desire a biology degree, but do not have a full eight semesters to commit to the program. Such students may be those also enrolled in the College of Education and Human Services, transfer students, or students choosing a second major. However, students who double-major may not select the B.A. program in biology and a closely-related B.S. program such as Behavioral Neuroscience or Health Science.

Students seeking to enroll in the Bachelor of Arts program in Biology must consult with the Chair of the Department of Biology and Behavioral Neuroscience before being considered for this program.

Program Requirements for:

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B.A. in Biology (p.)

Departmental Course Repeat Policy (p. 4)

Biology B.S. Requirements for Arts and Sciences students

(62-63 credits)

Code	Title	Credits
Complete the following foundational courses:		
BIO 115 & 115L	Principles of Biology I and Principles of Biology I Lab ¹	4
BIO 116 & 116L	Principles of Biology II and Principles of Biology II Lab ¹	4
Select five courses from Group I and Group II, with at least one course selected from each Group:		20
Group I		
BIO 272 & 272L	Intro to Marine Biology and Marine Biology Laboratory	
BIO 335 & 335L	Plant Biology and Modern Plant Biology Lab	
BIO 340 & 340L	Evolutionary Biology and Evolutionary Biology Lab	
BIO 350 & 350L	General Ecology and General Ecology Lab	
BIO 372 & 372L	Behavior of Marine Organisms: Evolutionary Approach and Behavior of Marine Organisms: Evolutionary Approach Lab	
Group II		
BIO 215 & 215L	Medical Microbiology and Microbiology Lab	
BIO 260 & 260L	Principles of Biology: Evolution, Diversity, and Biology of Cells and Principle of Biology: Cells Lab	
BIO 265 & 265L	Genetics and Genetics Lab	
BIO 300 & 300L	Developmental Biology and Developmental Biology Lab	
BIO 305 & 305L	Animal Physiology and Animal Physiology Lab	
BIO 370 & 370L	Immunology and Immunology Lab	
BNS 275 & 275L	Behavioral Neuroscience and Behavioral Neuroscience Lab	
BNS 310 & 310L	Neurobiology and Neurobiology Lab	
BNS 360 & 360L	Neurochemistry and Neurochemistry Lab	
BNS 375 & 375L	Neuroethology: Circuits of Behavior and Neuroethology Lab	
BCH 325 & BCH 326	Biochemistry and Biochem and Enzymology I Lab	

Mathematics

Select two of the following:		7-8
MTH 105	Algebra and Trigonometry ²	
or MTH 106 Precalculus		
MTH 210	Calculus I ²	
MTH 211	Calculus II ²	
BNS 250	Biostatistics (plus lab) ²	
or ENV 200 Statistical and Computer Applications in the Natural Sciences		
or MTH 120 Introduction to Applied Statistics		
Chemistry		
CHE 120 & CHE 121	Principles of Chemistry and Principles of Chemistry Lab	4
CHE 122 & CHE 123	Intro to Chemical Systems and Quantitative Methods Lab	4
CHE 211 & 211L	Organic Chemistry I and Organic Chemistry I Lab	4
CHE 214 & 214L	Organic Chemistry II and Organic Chemistry II Lab	4
Physics		
PHY 100 & 100L	Principles of Physics I and Principles of Physics I Lab	4
or PHY 200 & 200L General Physics I and General Physics I Lab		
PHY 101 & 101L	Principles of Physics II and Principles of Physics II Lab	4
or PHY 201 & 201L General Physics II and General Physics II Lab		
Senior Capstone Seminar		3
Select one of the following:		
BNS 415	Seminar in Behavioral Neuroscience	
BIO 400	Seminar in Cellular and Molecular Biology	
BIO 420	Seminar in Organismal Biology	
BIO 450	Seminar in Ecology & Evolution	
BIO 490	Independent Study: Research and Creative Expression ³	
Total Credits		62-63

¹ Students must earn a grade of "C" or better in these courses to meet the major requirement and before enrolling in upper-level courses for which these courses are prerequisites.

² Students must place into MTH 105 Algebra & Trigonometry or higher level mathematics to register for BIO 115 and BIO 116.

³ It is the student's responsibility to arrange an independent study with a faculty member in the Department. To be registered for a BIO 490, the student must complete an independent study form (<https://www.rider.edu/academics/academic-support/registrar/forms/>) and proposal with the faculty member.

Biology B.A. Requirements for other than College of Arts and Sciences students

(52 credits)

Code	Title	Credits
Requirements for the Major		
BIO 115 & 115L	Principles of Biology I and Principles of Biology I Lab	4
BIO 116 & 116L	Principles of Biology II and Principles of Biology II Lab	4
BIO 260 & 260L	Principles of Biology: Evolution, Diversity, and Biology of Cells and Principle of Biology: Cells Lab	4
BIO 265 & 265L	Genetics and Genetics Lab	4
BIO 350 & 350L	General Ecology and General Ecology Lab	4
Select one upper-level elective from the following:		4
BIO 300 & 300L	Developmental Biology and Developmental Biology Lab	
BIO 305 & 305L	Animal Physiology and Animal Physiology Lab	
BIO 335 & 335L	Plant Biology and Modern Plant Biology Lab	
BIO 340 & 340L	Evolutionary Biology and Evolutionary Biology Lab	
BIO 370 & 370L	Immunology and Immunology Lab	
BIO 372 & 372L	Behavior of Marine Organisms: Evolutionary Approach and Behavior of Marine Organisms: Evolutionary Approach Lab	
BCH 325	Biochemistry	
BNS 310 & 310L	Neurobiology and Neurobiology Lab	
BNS 360 & 360L	Neurochemistry and Neurochemistry Lab	
BNS 375 & 375L	Neuroethology: Circuits of Behavior and Neuroethology Lab	
Senior Capstone		4
Select one of the following options:		
BIO 490	Independent Study: Research and Creative Expression (4 credits)	
OR		
BIO 400	Seminar in Cellular and Molecular Biology (3 credits)	
or BIO 420 Seminar in Organismal Biology		
or BIO 450 Seminar in Ecology & Evolution		
AND		
BIO 491	Internship in Biology (as a lab facilitator (1 credit))	
Required Chemistry Courses:		8
CHE 120 & CHE 121	Principles of Chemistry and Principles of Chemistry Lab	
CHE 122 & CHE 123	Intro to Chemical Systems and Quantitative Methods Lab	
Select one of the following:		4
BCH 225 & 225L	Introduction to Organic and Biochemistry and Introduction to Organic & Biochemistry Lab	
CHE 211 & 211L	Organic Chemistry I and Organic Chemistry I Lab	

Select two of the following Mathematics courses: 8

MTH 105	Algebra and Trigonometry
or MTH 106 Precalculus	
MTH 210	Calculus I
BNS 250 & 250L	Biostatistics and Biostatistics Lab

Select one of the following Physics courses: 4

PHY 100 & 100L	Principles of Physics I and Principles of Physics I Lab
PHY 200 & 200L	General Physics I and General Physics I Lab

Total Credits 52

Department of Biology and Behavioral Neuroscience Course Repeat Policy

The following guidelines apply to courses offered by the Department of Biology & Behavioral Neuroscience. Students may repeat any biology (BIO) or behavioral neuroscience (BNS) course once without special permission *unless* they received an unsatisfactory grade (C-, D, F). With an unsatisfactory grade, students need permission from the department chair to repeat a class. They can not register on their own on MyRider. Students with an unsatisfactory grade should email the department chair to request permission to repeat a course. A course will be considered repeated if the student has previously earned a letter grade in the course, or if the student has previously withdrawn from the course after the Friday of the seventh week of classes (previously Withdrawal II or Withdrawal III).

Requirements for the Minor ¹

(20 credits)

Code	Title	Credits
Foundational Courses:		
BIO 115 & 115L	Principles of Biology I and Principles of Biology I Lab ^{2,3}	4
BIO 116 & 116L	Principles of Biology II and Principles of Biology II Lab ^{2,3}	4
Select three courses from Group I and Group II, with at least one course selected from each Group:		12
Group I		
BIO 272 & 272L	Intro to Marine Biology and Marine Biology Laboratory	
BIO 335 & 335L	Plant Biology and Modern Plant Biology Lab	
BIO 340 & 340L	Evolutionary Biology and Evolutionary Biology Lab	
BIO 350 & 350L	General Ecology and General Ecology Lab	
BIO 372 & 372L	Behavior of Marine Organisms: Evolutionary Approach and Behavior of Marine Organisms: Evolutionary Approach Lab	
Group II		
BIO 215 & 215L	Medical Microbiology and Microbiology Lab	

BIO 260 & 260L	Principles of Biology: Evolution, Diversity, and Biology of Cells and Principle of Biology: Cells Lab
BIO 265 & 265L	Genetics and Genetics Lab
BIO 300 & 300L	Developmental Biology and Developmental Biology Lab
BIO 305 & 305L	Vertebrate Physiology and Vertebrate Physiology Lab
BIO 370 & 370L	Immunology and Immunology Lab
BNS 310 & 310L	Neurobiology and Neurobiology Lab
BNS 360 & 360L	Neurochemistry and Neurochemistry Lab
BNS 375 & 375L	Neuroethology: Circuits of Behavior and Neuroethology Lab

Total Credits 20

¹ Not available to Behavioral Neuroscience, Biochemistry, Health Sciences or Science Education majors.

² Students must earn a grade of "C" or better in this course to meet the major requirements and before enrolling in upper-level courses for which these courses are prerequisites.

³ Students must place into MTH 105 Algebra & Trigonometry or higher level mathematics in order to register for BIO 115 and BIO 116.

Academic Plan of Study

The following educational plan is provided as a sample only. Rider students who do not declare a major during their freshman year; who are in a Continuing Education Program; who change their major; or who transfer to Rider may follow a different plan to ensure a timely graduation. Each student, with guidance from their academic advisor, will develop a personalized educational plan.

Course	Title	Credits
Year 1		
Fall Semester		
BIO 115 & 115L	Principles of Biology I and Principles of Biology I Lab	4
CHE 120	Principles of Chemistry	3
CHE 121	Principles of Chemistry Lab	1
MTH 105	Algebra and Trigonometry ¹	4
CMP 120	Seminar in Writing and Rhetoric	3
Semester Credit Hours		15
Spring Semester		
BIO 116 & 116L	Principles of Biology II and Principles of Biology II Lab	4
CHE 122	Intro to Chemical Systems	3
CHE 123	Quantitative Methods Lab	1
MTH 210 or BNS 250/BNS 250L	Calculus I or Biostatistics	4
CMP 125	Seminar in Writing and Research	3
Semester Credit Hours		15

Year 2**Fall Semester**

BIO 260 & 260L	Principles of Biology: Evolution, Diversity, and Biology of Cells and Principle of Biology: Cells Lab	4
CHE 211 & 211L	Organic Chemistry I and Organic Chemistry I Lab	4
HIS 150	Pre-Modern World: Evolution to Revolution	3
Social Perspectives		3
Semester Credit Hours		14

Spring Semester

BIO 265 & 265L	Genetics and Genetics Lab	4
CHE 214 & 214L	Organic Chemistry II and Organic Chemistry II Lab	4
HIS 151 or HIS 152 or HIS 153	World in the Modern Era: Exploration to Globalization or Contemporary World: Historical Perspectives or Cold War: A Global History	3
Social Perspectives		3
Semester Credit Hours		14

Year 3**Fall Semester**

BIO 265 or higher BIO/BNS Course & Lab (3 of 5)		4
Choose either sequence		4
PHY 100 & 100L	Principles of Physics I and Principles of Physics I Lab ³	
OR		
PHY 200 & 200L	General Physics I and General Physics I Lab	
Foreign Language		3
Aesthetic Perspectives: Literature		3
Semester Credit Hours		14

Spring Semester

BIO 265 or higher BIO/BNS Course & Lab (4 of 5)		4
Foreign Language		3
Select one of the following:		4
PHY 101 & 101L	Principles of Physics II and Principles of Physics II Lab	
PHY 201	General Physics II	
Aesthetic Perspectives: Fine Arts		3
Philosophical Perspectives		3
Semester Credit Hours		17

Year 4**Fall Semester**

BIO 265 or higher BIO/BNS Course & Lab (5 of 5)		4
BIO 400	Seminar in Cellular and Molecular Biology	3
Three Elective Courses ²		9
Semester Credit Hours		16

Spring Semester

Five Elective Courses ²	15
Semester Credit Hours	15
Total Credit Hours for Graduation	120

¹ For course placement information see <https://www.rider.edu/student-life/first-year-experience/orientation/placement-testing> (<https://www.rider.edu/student-life/first-year-experience/orientation/placement-testing/>)

² Please note that elective credits may be used to complete requirements in a second major or minor.

³ Natural and Physical Sciences and Mathematics Core requirements are included in the major.

Courses and Descriptions**BIO 100 Life Science 3 Credits**

An introductory course for non-science majors in which students develop an understanding of the nature of science and are introduced to foundational topics in the biological life sciences and how they relate to human affairs. The course may emphasize human evolution, genetics, aging, disease, reproduction, bioethics or other topics in biology. This course counts towards the fulfillment of the Disciplinary Perspectives element of the CAS general education curriculum.

BIO 102 The Biology of Cannabis 1.5 Credits

In this course, you will learn about many aspects of the biology of cannabis, including botany, genetics, growth techniques, strain selection, and health benefits. Emphasis is placed on current methods in the marijuana industry to help legal growers and professionals understand best practices for cultivation, management, and medicinal use. Current literature and sources will be discussed.

BIO 110 Life Science: Inquiry Approach 4 Credits

An introductory course for non-science majors in which students develop an understanding of biological evolution, the molecular basis of heredity, the cell, matter, energy and organization in living systems, and the interdependence of organisms. In addition, students will develop an understanding of science as a human endeavor, the nature of scientific knowledge, and historical perspectives. Through investigative activities, students will develop an understanding about scientific inquiry and develop abilities necessary to do scientific inquiry. Three hours of lecture and one three-hour lab per week.

Corequisite(s): BIO 110L.

BIO 110L Life Science: Inquiry Approach Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course.

Corequisite(s): BIO 110.

BIO 115 Principles of Biology I 4 Credits

An introductory biology course focusing on major themes of biology: what is life?; Cells as fundamental structure and functional unit of life; information transmission, storage and retrieval; Diversity and unity of life explained by evolution. Three hours of lecture and one three-hour lab per week.

Corequisite(s): BIO 115L.

BIO 115L Principles of Biology I Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course.

Corequisite(s): BIO 115.

BIO 116 Principles of Biology II 4 Credits

An introductory biology course focusing on major themes of biology: Energy and matter to carry out life's essential functions; Interdependent relationships characterize biological systems (homeostasis, growth & development); Behavior of living things; Ecology and the environment. Three hours of lecture and one three-hour lab per week.

Corequisite(s): BIO 116L.

BIO 116L Principles of Biology II Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course.

Corequisite(s): BIO 116.

BIO 206 The Pharmaceutical Industry 3 Credits

An introduction to drug discovery and development. Topics include how drugs are used to diagnose, cure, treat, and prevent disease and how drugs affect body function. The origins of diseases and the early attempts at treatment are also covered. Designed for business majors; does not satisfy requirements for the biology major.

Prerequisite(s): any BIO1XX or BNS1XX or CHE 1XX.

BIO 210 Hospital Intern Program 2 Credits

An internship that provides students with the experience in the practical aspects of medicine. Major departments in the hospital such as the emergency room, operating room, clinic, radiology, and the laboratory will be open for student rotations. Field trips to various medical schools in the area will provide information on professional school educational opportunities available in the health professions.

Prerequisite(s): sophomore standing or above and permission of instructor.

BIO 215 Medical Microbiology 4 Credits

Biology of prokaryotes of medical interest with emphasis placed on diversity and host-pathogen interaction. Current research literature will be covered and presented by students. Methods of microbial identification are introduced in the laboratory and applied in the identification of mock clinical isolates. Three hours of lecture and one three-hour lab per week.

Prerequisite(s): BIO 115, BIO 116 with a grade of C or better in each course,

Corequisite(s): BIO 215L.

BIO 215L Microbiology Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course.

Corequisite(s): BIO 215.

BIO 221 Human Anatomy & Physiology I 4 Credits

A comprehensive survey of the structure and function of musculo-skeletal systems, neuroendocrine systems and related tissues and cellular interactions. Physiological applications include homeostasis, muscle dynamics, and cell activities. Laboratory exercises complement lecture material through the use of animal dissections, wet labs, computer-assisted investigations, microscopy, and models. Exams, case histories, personal investigations, and lab practicums assess learning. Course emphasis supports allied health and pre-professional training. Three hours of lecture and one three-hour lab per week. Designed for allied health students; does not satisfy requirements for the biology major. Prerequisite(s): HSC major ONLY or Permission of instructor.

Corequisite(s): BIO 221L.

BIO 221L Human Anatomy & Physiology I Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course.

Corequisite(s): BIO 221.

BIO 222 Human Anatomy & Physiology II 4 Credits

A comprehensive survey of the organ systems of the body including special senses, cardiovascular, respiratory, digestive, excretory, reproduction and development. Physiological components include electrolytes, metabolism, nutrition, and the mechanisms of homeostasis and cell reception. Lab studies support lecture material through dissections, wet labs, computer-assisted learning, microscopy, and models. Assessment includes lab practicums, exams, and reports. Course emphasis supports allied health and pre-professional training. Designed for allied health students; does not satisfy requirements for the biology major. Prerequisite(s): BIO 221.

Corequisite(s): BIO 222L.

BIO 222L Human Anatomy & Phys II Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course. Prerequisite(s): BIO 221L.

Corequisite(s): BIO 222.

BIO 260 Principles of Biology: Evolution, Diversity, and Biology of Cells 4 Credits

Lectures and labs focus on basic cell biology. Cell diversity and function, genetics and biotechnology are emphasized. Three hours of lecture and one three-hour lab per week. Prerequisite(s): BIO 115/115L and BIO 116/116L or BIO 115, BIO 117, (BNS 118 or BNS 275).

Corequisite(s): BIO 260L.

BIO 260L Principle of Biology: Cells Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course.

Corequisite(s): BIO 260.

BIO 265 Genetics 4 Credits

A comprehensive course focusing on molecular, Mendelian, and population genetics. Topics covered will include molecular advances in the study of genetics, including genomics and bioinformatics; evolution and the effects of genetic mutations; the application of population genetics to forensic science; genetic problem solving, including genetic crosses and statistical analysis; and regulation of gene expression. The laboratory for this course will introduce students to commonly used genetic model organisms and basic molecular biology techniques. Three hours of lecture and one three-hour lab per week. Prerequisite(s): BIO 115 with a minimum grade of C and BIO 116 with a minimum grade of C and (BIO 117 with a minimum grade of C or BIO 260 with a minimum grade of C)

Corequisite(s): BIO 265L.

BIO 265L Genetics Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course. Prerequisite(s): BIO 115 with a minimum grade of C and BIO 116 with a minimum grade of C and (BIO 117 with a minimum grade of C or BIO 260 with a minimum grade of C)

Corequisite(s): BIO 265.

BIO 272 Intro to Marine Biology 4 Credits

Introduces students to the study of marine environments, emphasizing the diversity, ecology, and physiology of marine animals, algae, and plants. Aspects of the human impact on marine environments are also discussed.

Prerequisite(s): BIO 115 with a minimum grade of C, or BIO 116 with a minimum grade of C.

BIO 272L Marine Biology Laboratory 0 Credits

This lab is a co-requisite and must be taken with the corresponding course. Course

Prerequisite(s): BIO 115 or BIO 116.

BIO 290 Special Topics in Biology 3 Credits**BIO 300 Developmental Biology 4 Credits**

Lectures and laboratories explore molecular, cellular, and genetic mechanisms of animal development. Aspects of gametogenesis, fertilization, induction, cytoplasmic determinants, morphogenetic movements, differentiation and developmental evolution are discussed.

Three hours of lecture and one three-hour lab per week. **Prerequisite(s):** BIO 115 with a minimum grade of C and BIO 116 with a minimum grade of C and (BIO 117 with a minimum grade of C or BIO 260 with a minimum grade of C)

Corequisite(s): BIO 300L.

BIO 300L Developmental Biology Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course. **Prerequisite(s):** BIO 115 with a minimum grade of C and BIO 116 with a minimum grade of C and (BIO 117 with a minimum grade of C or BIO 260 with a minimum grade of C)

Corequisite(s): BIO 300.

BIO 305 Animal Physiology 4 Credits

Study of the principles and mechanisms of animal physiology. Topics include the nervous system, muscle physiology, cardiovascular physiology, respiration, gastrointestinal activity, renal function, and endocrine physiology. Lectures and laboratory exercises emphasize homeostatic mechanisms and organ-system interactions. Three hours of lecture and one three-hour lab per week.

Prerequisite(s): BIO 115 and BIO 116 with a grade of C or better in each course.

BIO 305L Animal Physiology Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course.

Prerequisite(s): BIO 115 and BIO 116 with a grade of C or better in each course.

BIO 310 Health and Ecology in Central America 3 Credits

This interdisciplinary course seeks to provide a unique educational experience for students to explore the relationship between human health, ecological health, and environmental concerns. Using a country in Central America as our focus (e.g., Costa Rica or Panama) we will begin by studying the health care system, including visits to several hospitals and clinics to see firsthand some of the challenges they face. We will also examine the ecotourism industry in the country, including visits to coffee plantations and a National Wildlife Refuge on the coast, again with a focus on environmental health challenges. We begin our exploration of these topics with three pre-departure meetings at Rider University during the Fall semester. We continue our experience with a ten-day trip to Central America during the January term and will meet for four additional class sessions during the Spring semester.

BIO 335 Plant Biology 4 Credits

Biology of seed plants, including growth, development, and reproduction of flowering plants. Emphasis is placed on acclimation and adaptations demonstrating environmental influences on plant structure and function. Current literature involving molecular mechanisms of control will be discussed. Three hours of lecture and one three-hour lab per week. One Saturday field trip. **Prerequisite(s):** BIO 115 with a minimum grade of C and BIO 116 with a minimum grade of C.

Corequisite(s): BIO 335L.

BIO 335L Modern Plant Biology Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course. **Prerequisite(s):** BIO 115 with a minimum grade of C and BIO 116 with a minimum grade of C

Corequisite(s): BIO 335.

BIO 340 Evolutionary Biology 4 Credits

Where did we come from? This course will explore the generation of biological diversity on earth. Course topics will include: the history of evolutionary thought; the different lines of evidence and fields of inquiry that bear on our understanding of evolution; selection vs. random changes in populations over time; speciation; extinction; the molecular basis of evolution; and evolutionary developmental biology. Three hours of lecture and one three-hour lab per week. **Prerequisite(s):** BIO 115 with a minimum grade of C and BIO 116 with a minimum grade of C and BIO 260 with a minimum grade of C **Co-requisite(s):** BIO 340L.

BIO 340L Evolutionary Biology Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course. **Prerequisite(s):** BIO 115 with a minimum grade of C and BIO 116 with a minimum grade of C and BIO 260 with a minimum grade of C **Co-requisite(s):** BIO 340.

BIO 350 General Ecology 4 Credits

An investigation of the processes that regulate the distribution of plants and animals throughout the biosphere. Relationships among species and their interactions with the environment are stressed. Quantitative analyses of experimental results and current research in basic and applied ecology are discussed. Laboratory activities explore conceptual models using both field activities and computer simulations. Three hours of lecture and one three-hour lab per week. One Saturday field trip (laboratory time will be adjusted accordingly). **Prerequisite(s):** BIO 115 with a minimum grade of C and BIO 116 with a minimum grade of C

Corequisite(s): BIO 350L.

BIO 350L General Ecology Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course. **Prerequisite(s):** BIO 115 with a minimum grade of C and BIO 116 with a minimum grade of C

Corequisite(s): BIO 350.

BIO 370 Immunology 4 Credits

An introduction to the cells and molecules of the immune system with emphasis on recent advances. Topics include AIDS, autoimmunity, transplantation, and cancer. Readings from current journals will be discussed and presented by students. The laboratory will introduce current research techniques and then apply these to a research problem with critical analyses of the data generated. Three hours of lecture and one three-hour lab per week. **Prerequisite(s):** BIO 115 with a minimum grade of C and BIO 116 with a minimum grade of C and (BIO 260 with a minimum grade of C or BIO 117 with a minimum grade of C)

Corequisite(s): BIO 370L.

BIO 370L Immunology Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course. Prerequisite(s): BIO 115 with a minimum grade of C and BIO 116 with a minimum grade of C and (BIO 260 with a minimum grade of C or BIO 117 with a minimum grade of C)

Corequisite(s): BIO 370.

BIO 372 Behavior of Marine Organisms: Evolutionary Approach 4 Credits

An examination of the underlying mechanisms and evolutionary causes of behavior, including habitat use, feeding, and mate choice, particularly in marine organisms. The laboratory will involve collecting, analyzing and interpreting field data and performing experiments in the lab using a variety of marine organisms including fish and crabs. Three hours of lecture and one three-hour lab per week. Some full-day field trips (usually on a weekend) are required. Prerequisite(s): BIO 115, BIO 116 with a grade of C or better in each course.

Corequisite(s): BIO 372L.

BIO 372L Behavior of Marine Organisms: Evolutionary Approach Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course. Course

Prerequisite(s): BIO 115 or BIO 116.

BIO 390 Special Topics in Biology 4 Credits

This course will provide students the opportunity to deeply explore a specialized topic in the broad field of biological sciences. The course entails 3 hours of lecture and 3 hours of laboratory per week, and may satisfy upper-level biology course requirements for the Biology, Behavioral Neuroscience, and/or Health Sciences majors. Examples may include such topics as ornithology, ethnobotany, entomology, neuroelectrophysiology, or exercise physiology, among other possibilities.

Prerequisite(s): BIO 115 and BIO 116.

BIO 390L Special Topics in Biology Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course.

Prerequisite(s): BIO 115 and BIO 116.

BIO 400 Seminar in Cellular and Molecular Biology 3 Credits

Critical analysis of the scientific literature pertaining to current topics in cell and molecular biology. Topics may include: genomics, regulation of gene expression, development, and molecular processes of disease. Three hours of lecture per week.

Prerequisite(s): BIO 115, BIO 116, (BIO 260 or BIO 117) with a grade of C or better in each course, junior standing, and permission of instructor.

BIO 416 Bioinformatics 3 Credits

A comprehensive overview of relevant computer-based technologies used in genome research, DNA sequence analysis, and evolutionary biology. Will focus extensively on Internet resources and predictive algorithm usage for determining evolutionary relationships of organisms based on molecular evidence. Lectures will focus on terms and concepts frequently used in genomic and bioinformatic research, while computer labs will allow students to perform hands-on projects with actual DNA sequence data.

Prerequisite(s): BIO 115, BIO 116, (BIO 260 or BIO 117) with a grade of C or better in each course, junior standing, permission of instructor and BIO 265 recommended.

BIO 420 Seminar in Organismal Biology 3 Credits

Critical analysis of the scientific literature pertaining to current topics in physiology and organismal biology. Topics may include hormonal control of behavior, immune pathogen interactions, and other aspects of whole animal and/or plant biology. Three hours of lecture per week.

Prerequisite(s): BIO 115, BIO 116 with a grade of C or better in each course; junior standing, and permission of instructor.

BIO 450 Seminar in Ecology & Evolution 3 Credits

Critical analysis of the scientific literature pertaining to current topics in ecology and evolutionary biology. Ecology and evolution of terrestrial and aquatic systems may include scales of adaptation, mechanisms, or human impacts. Three hours of lecture per week.

Prerequisite(s): BIO 115, BIO 116 with a grade of C or better in each course; junior standing, and permission of instructor.

BIO 490 Independent Study: Research and Creative Expression 1-4 Credits

Immerses the student in field or laboratory research. The student learns to organize material, use the literature, make precise measurements, and obtain reproducible data. If possible, the student will publish the results or present them at a scientific meeting.

BIO 491 Internship in Biology 1-4 Credits

A supervised work experience in an approved organization where qualified students gain real-world knowledge and utilize their academic training in a professional environment. Placement may be in private, public, non-profit, or governmental organizations. These can include educational or research institutions. The method of evaluation will be formalized prior to the approval of the internship by the sponsoring faculty and should include keeping a journal of activities, a term paper or project report and a poster presentation. 2.5 GPA required.

Prerequisite(s): Permission of the instructor.