

BIOLOGY AND MOLECULAR BIOLOGY

COLLEGE OF SCIENCE AND MATHEMATICS

Chairperson: *Quinn Vega*

The student can prepare for a biology career, graduate work, or professional programs in medicine, dentistry, medical technology, physical therapy, veterinary medicine, pharmacy and other fields related to biology, by taking the major requirements with a proper selection of electives. Students can obtain certification to teach biology by completing the professional sequence. A minor in biology is also available.

Outstanding students can take advantage of the honors program and be granted an "Honors in Biology" by fulfilling the prescribed requirements. For information about the program, contact the department chairperson.

Freshman courses offered for biology majors assume that the student has taken biology, chemistry and physics and at least three years of college preparatory mathematics in high school.

Biology Major (BS)

Required Courses

	Semester Hours
BIOL 112 Principles of Biology I	4
BIOL 113 Principles of Biology II	4
BIOL 199 Freshman Seminar in Biology.....	1
BIOL 213 Introduction to Ecology.....	4
BIOL 230 Cell and Molecular Biology	4
BIOL 380 Genetics	4
BIOL 490 Senior Seminar in Biology	3

Collateral Courses

CHEM120 General Chemistry I	4
CHEM121 General Chemistry II.....	4
CHEM230 Organic Chemistry I	3
CHEM231 Organic Chemistry II.....	3
CHEM232 Experimental Organic Chemistry I.....	2

Select one sequence:

PHYS 191 University Physics I	4
PHYS 192 University Physics II	4
OR	
PHYS 193 College Physics I	4
PHYS 194 College Physics II.....	4

Select one sequence:

MATH109 Statistics	3
MATH111 Applied Precalculus.....	4
OR	
MATH112 Precalculus Mathematics.....	3
MATH116 Calculus A	4
OR	
MATH122 Calculus I.....	4
MATH 221 Calculus II	4

Major Electives

Select one biology elective from each of the following 4 areas and one additional elective..... 15-20

A. Cell and Molecular	
BIOL 350 Microbiology.....	4
BIOL 433 Developmental Biology.....	4
BIOL 434 Molecular Biology.....	3
BIOL 435 Experimental Molecular Biology	3
BIOL 444 Cell Physiology	3

BIOL 445 Immunology	3
BIOL 446 Endocrinology	3
BIOL 457 Virology	3
BIOL 475 Medical Genetics.....	3
BIOL 476 Biology of Cancer	3
BIOL 482 Research Community I: Molecular Biology	4
BIOL 483 Research Community II: Molecular Biology	4
BIOL 486 Selected Topics in Biology	3-4
BIOL 497 Genomics.....	3
BIOL 498 Proteomics.....	3

B. Ecology

BIMS 220 Introduction to Marine Biology.....	4
BIOL 300 Environmental Biology and Related Controversial Issues.....	3
BIOL 330 Introduction to Animal Behavior	3
BIOL 370 Principles of Ecology	4
BIOL 417 Evolutionary Biology	3
BIOL 420 Economic Botany	3
BIOL 426 New Jersey Flora.....	4
BIOL 430 Ornithology	3
BIOL 431 Entomology	3
BIOL 436 Phylogenetic Zoology	4
BIOL 460 Biological Oceanography	3
BIOL 461 Aquatic Ecology.....	3
BIOL 484 Research Community I: Ecology	4
BIOL 485 Research Community II: Ecology	4
BIOL 486 Selected Topics in Biology	3-4

C. Organismal

BIOL 417 Evolutionary Biology	3
BIOL 420 Economic Botany	3
BIOL 425 Elementary Plant Physiology	4
BIOL 426 New Jersey Flora.....	4
BIOL 432 Medical Entomology	3
BIOL 433 Developmental Biology.....	4
BIOL 436 Phylogenetic Zoology	4
BIOL 439 Biology of Animal Parasites	3
BIOL 440 Gross Mammalian Anatomy	4
BIOL 441 Comparative Anatomy of Vertebrates.....	4
BIOL 442 Human Physiology	4
BIOL 443 Vertebrate Embryology	4
BIOL 445 Immunology	3
BIOL 446 Endocrinology	4
BIOL 447 Fundamentals of Pharmacology	3
BIOL 448 Mammalian Microanatomy	4
BIOL 450 Medical Microbiology.....	3
BIOL 457 Virology	3
BIOL 476 Biology of Cancer	3
BIOL 480 Research Community I: Organism Biology	4
BIOL 481 Research Community II: Organism Biology.....	4
BIOL 486 Selected Topics in Biology	3-4

D. Research

BICL 404 Plant and Animal Histological Techniques	3
BICL 405 Cell Culture	3
BICL 406 Scanning Electron Microscopy	4
BIOL 409 Externship in Biological Research (Cooperative Education)1-4	4
BIOL 411 Introduction to Transmission Electron Microscopy.....	4
BIOL 418 Biology Independent Research.....	4
BIOL 480 Research Community I: Organism Biology	4
BIOL 481 Research Community II: Organism Biology.....	4
BIOL 482 Research Community I: Molecular Biology	4
BIOL 483 Research Community II: Molecular Biology	4
BIOL 484 Research Community I: Ecology	4
BIOL 485 Research Community II: Ecology	4

E. One additional elective from above.

Biology Major (BS) with Teacher Certification in Biological Science

Students who wish to pursue P-12 in Biological Science teacher certification must apply to and be admitted to the Teacher Education Program. Please see the Teacher Education Program section of this catalog for the required professional sequence of courses and other important program requirements, guidelines, and procedures. Students are strongly advised to obtain a Teacher Education Program Handbook in addition to reading the information provided in this catalog.

Required Courses

	Semester Hours
BIOL 112 Principles of Biology I	4
BIOL 113 Principles of Biology II	4
BIOL 213 Introduction to Ecology.....	4
BIOL 230 Cell and Molecular Biology	4
BIOL 380 Genetics	4

Collateral Courses

CHEM120 General Chemistry I	4
CHEM121 General Chemistry II.....	4
CHEM230 Organic Chemistry I	3
CHEM231 Organic Chemistry II.....	3
CHEM232 Experimental Organic Chemistry I.....	2

Select one sequence:

PHYS 191 University Physics I	4
PHYS 192 University Physics II	4
OR	
PHYS 193 College Physics I	4
PHYS 194 College Physics II.....	4

Select one sequence:

MATH109 Statistics	3
MATH111 Applied Precalculus.....	4
OR	
MATH 112 Precalculus Mathematics.....	3
MATH 116 Calculus A	4
OR	
MATH 122 Calculus I.....	4
MATH 221 Calculus II	4

One course in Earth Science (4 s.h.)

GEOS 107 Planet Earth	4
GEOS 112 Physical Geology.....	4
GEOS 114 Historical Geology	4
GEOS 125 Earth and the Environment.....	4

Major Electives (12 s.h.)

Select one biology elective from each of the following four areas:

A. Cell and Molecular

BIOL 350 Microbiology.....	4
BIOL 433 Developmental Biology.....	4
BIOL 434 Molecular Biology.....	3
BIOL 435 Experimental Molecular Biology	3
BIOL 444 Cell Physiology	3
BIOL 445 Immunology	3
BIOL 446 Endocrinology	3
BIOL 457 Virology	3
BIOL 475 Medical Genetics.....	3
BIOL 476 Biology of Cancer	3
BIOL 482 Research Community I: Molecular Biology	4
BIOL 483 Research Community II: Molecular Biology	4
BIOL 486 Selected Topics in Biology	3-4
BIOL 497 Genomics.....	3
BIOL 498 Proteomics.....	3

B. Ecology

BIMS 220 Introduction to Marine Biology.....	4
BIOL 300 Environmental Biology and Related Controversial Issues.....	3
BIOL 330 Introduction to Animal Behavior	3

BIOL 370 Principles of Ecology	4
BIOL 417 Evolutionary Biology	3
BIOL 420 Economic Botany	3
BIOL 426 New Jersey Flora.....	4
BIOL 430 Ornithology	3
BIOL 431 Entomology	3
BIOL 436 Phylogenetic Zoology	4
BIOL 460 Biological Oceanography	3
BIOL 461 Aquatic Ecology.....	3
BIOL 484 Research Community I: Ecology	4
BIOL 485 Research Community II: Ecology	4
BIOL 486 Selected Topics in Biology	3-4

C. Organismal

BIOL 417 Evolutionary Biology	3
BIOL 420 Economic Botany	3
BIOL 425 Elementary Plant Physiology	4
BIOL 426 New Jersey Flora.....	4
BIOL 432 Medical Entomology	3
BIOL 433 Developmental Biology.....	4
BIOL 436 Phylogenetic Zoology	4
BIOL 439 Biology of Animal Parasites	3
BIOL 440 Gross Mammalian Anatomy	4
BIOL 441 Comparative Anatomy of Vertebrates.....	4
BIOL 442 Human Physiology	4
BIOL 443 Vertebrate Embryology	4
BIOL 445 Immunology	3
BIOL 446 Endocrinology	4
BIOL 447 Fundamentals of Pharmacology	3
BIOL 448 Mammalian Microanatomy	4
BIOL 450 Medical Microbiology.....	3
BIOL 457 Virology	3
BIOL 476 Biology of Cancer	3
BIOL 480 Research Community I: Organism Biology	4
BIOL 481 Research Community II: Organism Biology.....	4
BIOL 486 Selected Topics in Biology	3-4

D. Research

BICL 404 Plant and Animal Histological Techniques	3
BICL 405 Cell Culture	3
BICL 406 Scanning Electron Microscopy	4
BIOL 409 Externship in Biological Research (Cooperative Education)I-4	4
BIOL 411 Introduction to Transmission Electron Microscopy.....	4
BIOL 418 Biology Independent Research.....	4
BIOL 480 Research Community I: Organism Biology	4
BIOL 481 Research Community II: Organism Biology.....	4
BIOL 482 Research Community I: Molecular Biology	4
BIOL 483 Research Community II: Molecular Biology	4
BIOL 484 Research Community I: Ecology	4
BIOL 485 Research Community II: Ecology	4

Biology Major (BS)

Environmental Science Concentration

Required Courses

	Semester Hours
BIOL 112 Principles of Biology I	4
BIOL 113 Principles of Biology II	4
BIOL 199 Freshman Seminar in Biology.....	1
BIOL 213 Introduction to Ecology.....	4
BIOL 230 Cell and Molecular Biology	4
BIOL 380 Genetics	4
BIOL 490 Senior Seminar in Biology	
OR	
GEOS 490 Seminar in Geoscience	2
BIOL 491 Research in Biology Literature.....	1

Collateral Chemistry Courses

CHEM 120 General Chemistry I	4
CHEM 121 General Chemistry II.....	4

CHEM 230 Organic Chemistry I	3
CHEM 231 Organic Chemistry II.....	3
CHEM 232 Experimental Organic Chemistry I.....	2

Collateral Mathematics Courses

Select one sequence:

MATH 112 Precalculus Mathematics.....	3
MATH 116 Calculus A	4
OR	
MATH 122 Calculus I.....	4
MATH 221 Calculus II	4
OR	
MATH 109 Statistics	3
MATH 111 Applied Precalculus.....	4

Collateral Physics Courses

Select one sequence:

PHYS 191 University Physics I	4
PHYS 192 University Physics II	4
OR	
PHYS 193 College Physics I	4
PHYS 194 College Physics II.....	4

Biology Major Elective

Select a minimum of 3 semester hours from the appropriate list to be obtained from the department

Environmental Science Required Courses

	Semester Hours
BIOL 256 Applied Environmental Microbiology	3
GEOS 112 Physical Geology.....	4
GEOS 450 Principles of Soil Science.....	3
GEOS 452 Geohydrology	
OR	
ENVR 452 Geohydrology.....	3
Pick one of the following two:	
GEOS 454 Environmental Geochemistry	
OR	
CHEM 320 Environmental Chemical Analysis.....	3

Concentration Elective

Select a minimum of 3 semester hours from the following	3
BIOL 300 Environmental Biology and Related Controversial Issues.....	3
BIOL 330 Introduction to Animal Behavior	3
BIOL 370 Principles of Ecology	3
BIOL 417 Evolutionary Biology	3
BIOL 420 Economic Botany	3
BIOL 422 Biodiversity	4
BIOL 425 Elementary Plant Physiology	4
BIOL 426 New Jersey Flora.....	4
BIOL 430 Ornithology	3
BIOL 431 Entomology	3
BIOL 460 Biological Oceanography	3
BIOL 461 Aquatic Ecology.....	3
BIMS 220 Introduction to Marine Biology.....	4

Special Program Requirements

Biology Honors

- Biology Major
 - Overall Grade Point Average 3.50
 - Biology Grade Point Average 3.70 with no grade lower than a “B”
 - Additional Courses
 - BIOL 418 Biology Independent Study
 - BIOL 491 Research in Biology Literature
- (2 Biology faculty sponsors needed)

Molecular Biology Major (BS)

The main objectives of our undergraduate Molecular Biology major are: to educate students in greater depth in molecular studies than would be possible in our Biology program, and to prepare students in the methodological advances which have changed the study of biology in recent years. The field of molecular biology has an impact on almost every other area of study in the biological sciences, and its development has led to expanded graduate and professional programs. The Molecular Biology curriculum will provide undergraduate students with a fundamental knowledge of the principles and practices inherent in the rapidly advancing field of molecular biology.

Students who major in Molecular Biology can also enter the burgeoning biotechnology industry, well prepared to compete in the modern scientific marketplace, as most institutions carry on basic or applied research in biomedical areas today using techniques of molecular biology. Students completing this major will be well-prepared to enter professional schools of medicine, dentistry, veterinary medicine, and optometry, as well as graduate programs.

Required Courses

	Semester Hours
BIOL 112 Principles of Biology I	4
BIOL 113 Principles of Biology II	4
BIOL 199 Freshman Seminar in Biology.....	1
BIOL 230 Cell and Molecular Biology	4
BIOL 350 Microbiology.....	4
BIOL 380 Genetics	4
BIOL 434 Introductory Molecular Biology.....	3
BIOL 435 Experimental Molecular Biology	3
BIOL 409 Externship in Biological Research (Cooperative Education).....	4
OR	
BIOL 418 Independent Research.....	4

Collateral Chemistry Courses

CHEM 120 General Chemistry I	4
CHEM 121 General Chemistry II.....	4
CHEM 230 Organic Chemistry I	3
CHEM 231 Organic Chemistry II.....	3
CHEM 232 Experimental Organic Chemistry I.....	2
CHEM 470 Biochemistry I	3
CHEM 471 Biochemistry II.....	3

Select one sequence:

PHYS 191 University Physics I	4
PHYS 192 University Physics II	4
OR	
PHYS 193 College Physics I	4
PHYS 194 College Physics II.....	4

Select one sequence:

MATH 109 Statistics	3
MATH 116 Calculus A	4
OR	
MATH 122 Calculus I.....	4
MATH 221 Calculus II	4

Select one of the following:

CMPT 109 Computer Applications	3
OR	
CMPT 183 Foundations of Computer Science I	3

Electives

Select a least 8 semester hours from the following:

BICL 405 Cell Culture	3
BICL 406 Scanning Electron Microscopy	4
BIOL 409 Externship in Biological Research (Cooperative Education).....	4
BIOL 411 Introduction to Transmission Electron Microscopy.....	4
BIOL 418 Biology Independent Research.....	4
BIOL 425 Elementary Plant Physiology	4
BIOL 442 Human Physiology	4
BIOL 443 Vertebrate Embryology	4
BIOL 444 Cell Physiology	3
BIOL 445 Immunology	3
BIOL 446 Endocrinology	4
BIOL 447 Fundamentals of Pharmacology	3
BIOL 450 Medical Microbiology.....	3

BIOL 471 Biomedical Ethics	2
BIOL 475 Medical Genetics.....	3
BIOL 476 Biology of Cancer	3
BIOL 492 Senior Colloquium	1

Biology Minor

Required Courses

BIOL 112 Principles of Biology I	4
BIOL 113 Principles of Biology II	4

Select one option from the following:

Option A (Molecular):

BIOL 230 Cell and Molecular Biology	4
BIOL 350 Microbiology.....	4
BIOL 380 Genetics	4
BIOL 434 Molecular Biology.....	3

Option B (Environmental):

BIOL 213 Introduction to Ecology.....	4
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And select 12 semester hours from the following:

BIOL 300 Environmental Biology and Related Controversial Issues.....	3
BIOL 330 Introduction to Animal Behavior	3
BIOL 370 Principles of Ecology	4
BIOL 420 Economic Botany	3
BIOL 426 New Jersey Flora.....	4
BIOL 430 Ornithology	3
BIOL 460 Biological Oceanography	3
BIOL 461 Aquatic Ecology.....	3
BIMS 220 Introduction to Marine Biology.....	4

Option C (Functional):

BIOL 230 Cell and Molecular Biology	4
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Select twelve semester hours from the following:

BIOL 350 Microbiology.....	4
BIOL 380 Genetics	4
BIOL 440 Gross Mammalian Anatomy	4
BIOL 442 Human Physiology	4
BIOL 443 Vertebrate Embryology	4
BIOL 445 Immunology	3
BIOL 446 Endocrinology	4
BIOL 447 Fundamentals of Pharmacology	3

Courses of Instruction

BIOL 405

CELL CULTURE 3.0
Theory of and practice in working with living cells: tissue culture techniques, cell communication, differentiation, regeneration and aging in several living cell systems.

Prerequisite: Departmental approval. Special fee.

BIOL 406

SCANNING ELECTRON MICROSCOPY 4.0
Introduction to theory and practice of scanning electron microscopy. Includes specimen preparation, scanning electron microscope operation, electron specimen interactions/imager, and microanalysis.

Prerequisite: Departmental approval. Special fee.

BIOL 100

BIOLOGICAL SCIENCES 4.0
The study of life from molecule to organism with focus on structure and function of cells, mechanisms of heredity and change, survey of animals and plants and their interrelationships in the living world. Open to non-majors as well as majors. BIOL 100 is not included in the GPA as a biology major course. (3 hours lecture, 2 hours laboratory.) Meets the Gen Ed 2002—Natural/Physical Science Laboratory. Meets the 1983 General Education Requirement (GER)—Natural/Physical Science, Laboratory or Non-laboratory Science.

Prerequisite: Special fee.

BIOL 107

BIOLOGY FOR SURVIVAL 4.0

Basic concepts of biology that focus on social implications of pollution, population control, radiation, drugs, pesticides, the genetic revolution, etc. For non-science majors. Biology majors may only take this course as a free elective. (3 hours lecture.) Meets the 1983 General Education Requirement (GER)—Natural/Physical Science, Non-laboratory Science Only.

BIOL 109

THE LIVING WORLD 4.0

This course will provide students an opportunity to learn about the biological and environmental components of life and how these components interact to affect their own lives. This course is designed to be effective for and approachable by students who are not biology majors. (3 hours lecture, 2 hours laboratory.) No prerequisites in biology are needed. Meets Gen Ed 2002—Natural/Physical Science Laboratory. Meets the 1983 General Education Requirement (GER)—Natural/Physical Science, Non-Laboratory Science Only.

Prerequisite: Special fee.

BIOL 110

THE BIOLOGY OF HUMAN LIFE 4.0

The course is intended to serve the non-biology major and present a basic introduction to human anatomy and physiology. It will provide students with a laboratory experience so that they may learn the scientific method and its application in the field of human biology. This course will provide these students with a body of knowledge specific to human anatomy and physiology so that they may be well informed when dealing with important personal, family and societal issues relative to health and life-style decisions. (3 hours lecture, 2 hours laboratory.) Meets Gen Ed 2002—Laboratory or Non-laboratory Science. Meets the 1983 General Education Requirement (GER)—Natural/Physical Science, Laboratory or Non-laboratory Science.

Prerequisite: Special fee.

BIOL 111

EMERGING DISEASES 3.0

This is a course to discuss biological, social, and ethical aspects of emerging diseases. Topics such as cancer, heart disease, stroke, and emerging infectious disease will be covered. Meets the 1983 General Education Requirement (GER)—Natural/Physical Science, Non-Laboratory Science only.

BIOL 112

PRINCIPLES OF BIOLOGY I 4.0

Principles of Biology I involves the study of life from molecule to multicellular organism with focus on structure and function of cells, mechanisms of heredity and change, and the ways in which these processes shape higher levels of biological organization. This course is designed to fulfill the first core course requirement of the biology major.

Prerequisite: BIOL 100 or minimum MSUPT composite test score of 160 for writing and reading. Special fee.

BIOL 113

PRINCIPLES OF BIOLOGY II 4.0

Principles of Biology II will provide an introductory level study of biodiversity and the origins of life, phylogenetic relationships among organisms, genetics, developmental biology, reproduction, the biology of populations and communities, and ecosystem processes.

Prerequisite: BIOL 100 or minimum MSUPT composite test score of 160 for writing and reading. Special fee.

BIOL 199

FRESHMAN SEMINAR IN BIOLOGY 1.0

An experience for biology freshmen that will help them to succeed as Biology majors by learning study skills and becoming acquainted with the culture of higher education. Meets Gen Ed 2002—New Student Seminar.

BIOL 213

INTRODUCTION TO ECOLOGY 4.0

Semester-long field oriented course designed as an introduction to the natural world. Emphasis will be placed on identifying and characterizing the variety of habitats in New Jersey through field observations, group and individual projects and specimen collection. (3 hours lecture, 3 hours laboratory.)

Prerequisites: BIOL 112 or 113 (or BIOL 120 or BIOL 132 if completed prior to Fall 2002). Special fee.

BIOL 215 HUMAN HEREDITY	3.0	BIOL 310 PRINCIPLES OF TOXICOLOGY I	3.0
A non-major course introducing concepts of classical heredity and modern molecular genetics, which stresses the techniques and significance of genetic knowledge and research. Meets the 1983 General Education Requirement (GER)—Natural/Physical Science, Non-laboratory Science Only.		Examination of the major classes of toxic agents by identifying characteristics of their toxicity and factors which modify this outcome. <i>Prerequisite: BIOL 230 and CHEM 231.</i>	
BIOL 230 CELL AND MOLECULAR BIOLOGY	4.0	BIOL 330 INTRODUCTION TO ANIMAL BEHAVIOR	3.0
An introduction to the chemistry, structure, and function of prokaryotic and eukaryotic cells. Topics covered include membrane structure and transport processes, bioenergetics and energy transformations in cells, DNA replication and expression, protein synthesis, and cell movement. (3 hours lecture, 3 hours laboratory.) <i>Prerequisites: CHEM 120 with a grade of "C-" or better. Special fee.</i>		Concepts and theories of the sensory world of animals and behavioral patterns resulting in environmental adaptations. <i>Prerequisites: BIOL 113 (or BIOL 132 if completed prior to Fall 2002).</i>	
BIOL 240 MAMMALIAN ANATOMY AND PHYSIOLOGY I	3.0	BIOL 350 MICROBIOLOGY	4.0
Human anatomy and physiology for health education and physical education majors. Not for Biology majors. Biology majors may only take this course as a free elective. (2 hours lecture, 2 hours laboratory.) <i>Prerequisite: Special fee.</i>		A study of bacteria, yeast, molds and other microorganisms in relation to modern biological concepts and the welfare of man. Standard techniques employed in the laboratory. (3 hours lecture, 3 hours laboratory.) <i>Prerequisite: BIOL 230 and CHEM 120. Special fee.</i>	
BIOL 241 MAMMALIAN ANATOMY AND PHYSIOLOGY II	3.0	BIOL 370 PRINCIPLES OF ECOLOGY	3.0
Human anatomy and physiology for health education and physical education majors. Not for Biology majors. Biology majors may only take this course as a free elective. (2 hours lecture, 2 hours laboratory.) <i>Prerequisite: BIOL 240. Special fee.</i>		To acquaint biology majors with the general principles of ecology, population dynamics and adaptations of plants and animals to the various habitats. (2 hours lecture, 2 hours laboratory.) <i>Prerequisites: BIOL 213. Special fee.</i>	
BIOL 243 HUMAN ANATOMY AND PHYSIOLOGY	4.0	BIOL 380 GENETICS	4.0
A study of the dynamics of the human body in relation to its structure and function is based on its nutritional input. Each organ system is discussed in relation to its contribution to the whole functioning organism, as well as a basic survey of its pathologies. Primarily for ADA certification. (3 hours lecture, 3 hours laboratory.) <i>Prerequisite: CHEM 130. Special fee.</i>		Lecture and lab. Heredity, gene and chromosomal structure and function, gene regulation, mutation and repair, genes in populations, genetic manipulation, and applied genetics are covered. Lab exercises demonstrate genetic concepts. A semester-long project with research paper is required. Required of all Biology majors and minors. Meets the University Writing Requirement for BICM, BIED, BIES, BIOL, MOBI, SIBC, SICS, SIMB majors. (3 hours lecture, 3 hours laboratory.) <i>Prerequisites: BIOL 230 with a grade of "C-" or better and CHEM 120. Special fee.</i>	
BIOL 244 ANATOMY AND PHYSIOLOGY OF MAMMALS I	4.0	BIOL 409 EXTERNSHIP IN BIOLOGICAL RESEARCH (COOPERATIVE EDUCATION)	1.0-4.0
The structure and function of the cell, tissue and organ systems-integumentary, skeletal, muscular, circulatory and respiratory. Non-majors only. (3 hours lecture, 2 hours laboratory.) <i>Prerequisites: Departmental approval; non-majors only. Special fee.</i>		Full- or part-time work in an established laboratory with a scientific investigator for the duration of the term. <i>Prerequisite: Departmental approval. Special fee.</i>	
BIOL 245 ANATOMY AND PHYSIOLOGY OF MAMMALS II	4.0	BIOL 411 INTRODUCTION TO TRANSMISSION ELECTRON MICROSCOPY	4.0
The structure and function of the organ systems - nervous, excretory, endocrine, digestive and reproductive. (3 hours lecture, 2 hours laboratory.) Not for Biology majors. <i>Prerequisites: BIOL 244; non-majors only; departmental approval. Special fee.</i>		Basic theory and practice of electron microscopy. Specimen preparation ultramicrotomy, microscopy, photographic preparation of final print, interpretation of results. (3 hours lecture, 3 hours laboratory.) <i>Prerequisite: BIOL 230. Special fee.</i>	
BIOL 254 APPLIED MICROBIOLOGY	3.0	BIOL 417 EVOLUTIONARY BIOLOGY	3.0
Microbiological concepts and techniques applicable to food and dairy processing, health and disease, water, waste and other environmental problems. (2 hours lecture, 3 hours laboratory.) <i>Prerequisite: CHEM 130. Special fee.</i>		Mechanisms and processes underlying biological evolution, including natural selection, genetic drift, mutation, quantitative genetics, and speciation. The central organizing principle of life science, evolutionary biology integrates the study of molecular biology, organisms, and ecology. <i>Prerequisite: BIOL 380.</i>	
BIOL 255 SURVEY OF MICROBIOLOGY	4.0	BIOL 418 BIOLOGY INDEPENDENT RESEARCH	1.0-4.0
Microbiological concepts and techniques applicable to medical, health and environmental problems. (3 hours lecture, 2 hours laboratory.) Not for Biology majors. <i>Prerequisite: CHEM 110 and 112; non-biology majors only. Special fee.</i>		Under the guidance of a sponsor, students will investigate individual problems of appropriate scope. A written and/or oral report is required. (Offered on demand.) <i>Prerequisite: Minimum G.P.A. 3.0 and departmental approval. Special fee.</i>	
BIOL 300 ENVIRONMENTAL BIOLOGY AND RELATED CONTROVERSIAL ISSUES	3.0		
Analysis of ecological problems of today's population trends and control, food production, environmental deterioration, waste disposal, etc. <i>Prerequisite: BIOL 213.</i>			

BIOL 425		
ELEMENTARY PLANT PHYSIOLOGY	4.0	
Major physiological processes of the flowering plant: growth, metabolism, photosynthesis, respiration, water relations and mineral nutrition. (Not offered every year.)		
<i>Prerequisites: BIOL 113 (or BIOL 120 if completed prior to Fall 2002) and CHEM 230. Special fee.</i>		
BIOL 426		
NEW JERSEY FLORA	4.0	
Field identification of mosses, liverworts, ferns, and seed plants in a variety of habitats. (Not offered every year.)		
<i>Prerequisite: BIOL 213. Special fee.</i>		
BIOL 430		
ORNITHOLOGY	4.0	
The biology, identification, and natural history of birds in a variety of habitats. Laboratory includes trips on a varying schedule. (3 hours lecture, 3 hours laboratory.)		
<i>Prerequisite: BIOL 113 (or BIOL 132 if completed prior to Fall 2002). Special fee.</i>		
BIOL 431		
ENTOMOLOGY	3.0	
Identification, physiology and ecology of common insect families. (Not offered every year.)		
<i>Prerequisite: BIOL 113 (or BIOL 132 if completed prior to Fall 2002). Special fee.</i>		
BIOL 432		
MEDICAL ENTOMOLOGY	3.0	
The study of arthropods that are vectors of diseases afflicting man and domestic animals. (Not offered every year.)		
<i>Prerequisite: BIOL 113 (or BIOL 132 if completed prior to Fall 2002). Special fee.</i>		
BIOL 433		
DEVELOPMENTAL BIOLOGY	4.0	
This course discusses the concepts and principles that are rapidly emerging from studies of developmental processes in animals. We shall consider egg organization, origins of cell differences, molecular mechanisms of cell differentiation, cell movements, inductive interactions in animals, long-range signaling mechanisms, and the cellular and molecular processes underlying pattern formation.		
<i>Prerequisites: BIOL 230, BIOL 380, and CHEM 231. Special fee.</i>		
BIOL 434		
INTRODUCTORY MOLECULAR BIOLOGY	3.0	
This course is designed to examine the molecular biology of plant and animal cells.		
<i>Prerequisites: BIOL 350 and 380 and CHEM 470.</i>		
BIOL 435		
EXPERIMENTAL MOLECULAR BIOLOGY	3.0	
A laboratory course that will introduce biology and molecular biology majors to the basic techniques of modern molecular biology. Techniques to be covered include nucleic acid isolation, restriction enzyme mapping, plasmid manipulation and subcloning, genomic library construction, PCR amplification, and DNA sequence analysis. (6 hours laboratory.)		
<i>Prerequisite: BIOL 434. Special fee.</i>		
BIOL 436		
PHYLOGENETIC ZOOLOGY	4.0	
Phylogenetic Zoology is a comprehensive survey of evolutionary zoology. The focus of the course is on the ecological and evolutionary processes that shape the natural histories of aquatic and terrestrial animals. Integrated lecture and laboratory investigations will explore the anatomy, physiology, diversity, ecology and evolutionary significance of animal clades. The course is designed to fulfill major elective requirements of the biology major.		
<i>Prerequisite: BIOL 213. Special fee.</i>		
BIOL 440		
GROSS MAMMALIAN ANATOMY	4.0	
Functional mammalian anatomy at the microscopic and gross level. Laboratory dissection of the cat and study of selected organs and anatomical models. (3 hours lecture, 3 hours laboratory.)		
<i>Prerequisite: BIOL 113 with a grade of "C-" or better (or BIOL 132 with a grade of "C-" or better if completed prior to Fall 2002). Special fee.</i>		
BIOL 442		
HUMAN PHYSIOLOGY	4.0	
Functions of animal organs and systems with emphasis on maintenance of homeostasis.		
<i>Prerequisite: BIOL 113 (or BIOL 132 if completed prior to Fall 2002), and BIOL 230 with a grade of "C-" or better, and CHEM 230. Special fee.</i>		
BIOL 443		
VERTEBRATE EMBRYOLOGY	4.0	
Developmental anatomy of the vertebrates, especially amphibian, chick and human. General concepts of development and cell differentiation. (Not offered every year.)		
<i>Prerequisites: BIOL 113 (or BIOL 132 if completed prior to Fall 2002), and BIOL 230. Special fee.</i>		
BIOL 444		
CELL PHYSIOLOGY	3.0	
Advanced course in cell function.		
<i>Prerequisites: BIOL 230 with a grade of "C-" or better, and CHEM 230.</i>		
BIOL 445		
IMMUNOLOGY	3.0	
Cellular and humoral immunal responses, immunoglobulins, antigen-antibody reactions, immunopathology, transplantation, and blood transfusion. (Not offered every year.)		
<i>Prerequisites: BIOL 230 with a grade of "C-" or better, and CHEM 230.</i>		
BIOL 446		
ENDOCRINOLOGY	3.0	
Basic anatomy and physiology of the mammalian endocrine glands with special attention directed to the human endocrine glands. The interrelationships between the various endocrines including neural control and the role of these glands in maintaining the homeostasis of the body will be stressed.		
<i>Prerequisite: BIOL 230 with a grade of "C-" or better, and CHEM 230.</i>		
BIOL 447		
FUNDAMENTALS OF PHARMACOLOGY	3.0	
Introduction to the study of chemicals that have biological effects, with special emphasis on those with medical importance.		
<i>Prerequisites: BIOL 230 and CHEM 230.</i>		
BIOL 448		
MAMMALIAN MICROANATOMY	4.0	
Detailed examination of mammalian tissues using both light and electron micrographic analyses. Epithelial, connective, muscle, nervous and gametic tissues will be thoroughly examined as they occur structurally and functionally within mammalian organ systems.		
<i>Prerequisite: BIOL 113 (or BIOL 132 if completed prior to Fall 2002) and BIOL 230. Special fee.</i>		
BIOL 450		
MEDICAL MICROBIOLOGY	3.0	
The course is designed to acquaint the Biology major with those microorganisms which cause disease, the prevention of disease, therapeutic agents to control microbial diseases and the body's natural defense mechanisms.		
<i>Prerequisite: BIOL 350.</i>		
BIOL 457		
VIROLOGY	3.0	
This course will develop the fundamental principles of modern virology and examine the connection between viruses and disease. It will examine the molecular biology of virus replication, infection, gene expression, the structure of virus particles and genomes, pathogenesis, and classification of viruses.		
<i>Prerequisite: BIOL 230.</i>		

BIOL 458		
MICROBIAL GENETICS	3.0	
Microbial Genetics provides students with an understanding of the basis for genetic processes in microorganisms and the implication for higher organisms. The focus of the course will be on prokaryotes, particularly <i>E. coli</i> , and viruses, primarily bacteriophages. Current developments in microbial genetics, such as bioinformatics and genomics, will be presented.		
<i>Prerequisite: BIOL 350.</i>		
BIOL 460		
BIOLOGICAL OCEANOGRAPHY	3.0	
Biological processes within oceans and estuaries are considered in relation to the physical environment. Field and laboratory work. (Not offered every year.)		
<i>Prerequisites: BIOL 213. Special fee.</i>		
BIOL 461		
AQUATIC ECOLOGY	3.0	
Biological and physical processes of rivers and lakes. Field work and laboratory. (Not offered every year.)		
<i>Prerequisite: BIOL 112 and 113 (or BIOL 120 and BIOL 132 if completed prior to Fall 2002) or departmental approval. Special fee.</i>		
BIOL 471		
BIOMEDICAL ETHICS	2.0	
Seminar course dealing with ethical dilemmas posed by advances in biomedical technology. Background readings in ethics will be followed by discussions of readings on the applications and consequences of modern biomedical research.		
<i>Prerequisites: BIOL 380.</i>		
BIOL 475		
MEDICAL GENETICS	3.0	
A detailed study and analysis of human genetics, inborn genetic diseases, genomics, gene therapy, and the Human Genome Project.		
<i>Prerequisites: BIOL 380 with a grade of "C" or better; CHEM 230.</i>		
BIOL 476		
BIOLOGY OF CANCER	3.0	
An in-depth examination of the biology of cancer, including risk factors, genetics, causes of cancer, metastasis, therapies (conventional and recombinant DNA), and prevention will be presented. This course will also help students develop proficiency in critically evaluating primary scientific articles dealing with cancer.		
<i>Prerequisites: BIOL 230 and BIOL 380 and CHEM 231.</i>		
BIOL 480		
RESEARCH COMMUNITY I: ORGANISM BIOLOGY	4.0	
Survey of topics and techniques in contemporary organism biology research. Exploration and integration of molecular, cellular, physiological, population and ecological phenomena as they relate to biology at the organism level. Students will prepare and present a scientific research proposal for peer and faculty review.		
<i>Prerequisites: BIOL 112 and 113, (or BIOL 120 and BIOL 132 if completed prior to Fall 2002); and BIOL 213, BIOL 230, CHEM 231 and CHEM 232; or departmental approval. Special fee.</i>		
BIOL 481		
RESEARCH COMMUNITY II: ORGANISM BIOLOGY	4.0	
Team-based independent research on topics in contemporary organismal biology. Students will conduct experimental explorations designed in the prerequisite course, BIOL 480. Students will ultimately prepare and present a scientific research paper for peer and faculty review.		
<i>Prerequisite: BIOL 480. Special fee.</i>		
BIOL 482		
RESEARCH COMMUNITY I: MOLECULAR BIOLOGY	4.0	
Survey of topics and techniques in contemporary molecular biology research. Exploration and integration of molecular, cellular, physiological, population and ecological phenomena as they relate to biology at the molecular level. Students will prepare and present a scientific research proposal for peer and faculty review.		
<i>Prerequisites: BIOL 112 and BIOL 113, (or BIOL 120 and BIOL 132 if completed prior to Fall 2002); and BIOL 213, BIOL 230, CHEM 231 and CHEM 232; or departmental approval. Special fee.</i>		
BIOL 483		
RESEARCH COMMUNITY II: MOLECULAR BIOLOGY	4.0	
Team-based independent research on topics in contemporary molecular biology. Students will conduct experimental explorations designed in the prerequisite course, BIOL 482. Students will ultimately prepare and present a scientific research paper for peer and faculty review.		
<i>Prerequisite: BIOL 482. Special fee.</i>		
BIOL 484		
RESEARCH COMMUNITY I: ECOLOGY	4.0	
Survey of topics and techniques in contemporary ecology research. Exploration and integration of molecular, cellular, physiological, population and ecological phenomena as they relate to biology at the ecological level. Students will prepare and present a scientific research proposal for peer and faculty review.		
<i>Prerequisites: BIOL 112 and BIOL 113 (or BIOL 120 and BIOL 132 if completed prior to Fall 2002); and BIOL 213, BIOL 230, CHEM 231 and CHEM 232; or departmental approval. Special fee.</i>		
BIOL 485		
RESEARCH COMMUNITY II: ECOLOGY	4.0	
Team-based student independent research on topics in contemporary ecology. Students will conduct experimental explorations designed in the prerequisite course, BIOL 484. Students will ultimately prepare and present a scientific research paper for peer and faculty review.		
<i>Prerequisite: BIOL 484. Special fee.</i>		
BIOL 486		
SELECTED TOPICS IN BIOLOGY	3.0-4.0	
This course will acquaint the student with recent developments and specialized content in the biological sciences. Examples of topic areas are: vision science, biological modeling, forensic entomology, disease ecology, pathophysiology, and mitochondrial genomics. This course is designed to fulfill elective requirements of the biology major. This course may be repeated once for a maximum of eight credits.		
<i>Prerequisites: BIOL 213 and BIOL 230 or permission of instructor.</i>		
BIOL 487		
STATISTICAL GENOMICS	3.0	
Analysis of discrete data illustrated with genetic data on morphological characters, allozymes, restriction fragment length polymorphisms and DNA sequences. Maximum likelihood and Bayesian estimation including iterative procedures. Numerical resampling and bootstrapping. Development of statistical techniques for characterizing genetic disequilibrium and diversity. Locating genes with markers. Cross listed with Mathematical Sciences, STAT 487.		
<i>Prerequisites: BIOL 380 and STAT 401 or STAT 440, or equivalent.</i>		
BIOL 490		
SENIOR SEMINAR IN BIOLOGY	3.0	
Course which will allow the advanced undergraduate student to study controversial biological, bioethical, and ecological issues in a seminar format. Students will be required to produce written and verbal presentations utilizing peer-reviewed scientific papers. Presentations will be in both individual and group formats. This course is required for Biology seniors.		
<i>Prerequisite: Senior status in Department of Biology and Molecular Biology.</i>		
BIOL 491		
RESEARCH IN BIOLOGY LITERATURE	1.0	
Each student will survey current biological literature pertinent to a specific problem. A comprehensive report is required. May be repeated twice for a maximum of three semester hours.		
<i>Prerequisites: BIOL 230 with a grade of "C-" or better.</i>		
BIOL 492		
SENIOR COLLOQUIUM	1.0	
Students in this course will read primary resources material and interpret the data. This course will also teach students how to read, critique, and present scientific data to a peer group. Students will analyze, discuss, and present primary research articles with respect to scientific content, accuracy of the data and significance of the experiments.		
<i>Prerequisite: Senior status.</i>		

BIOL 497			
GENOMICS	3.0		
The course will examine the associations among nucleic acid sequence (RNA and DNA), structure, and function in complex biological systems, while treating these systems as biological databases. Both computer program-based and laboratory method will be discussed to better understand the relationship between nucleic acid sequence and function. Future opportunities and current limitations of genome analyses will be critically addressed.			
<i>Prerequisite: BIOL 380, CMPT 183, CHEM 470.</i>			
BIOL 498			
PROTEOMICS	3.0		
Proteomics is the study of the sum total of the proteins in an organism. This course will examine advanced methods of protein expression analysis, elucidation of protein-protein interactions, and functional analysis of all proteins.			
<i>Prerequisites: BIOL 380, CMPT 183, CHEM 470.</i>			
BIMS 220			
INTRODUCTION TO MARINE BIOLOGY	4.0		
A field and laboratory oriented course covering the characteristics of marine plants and animals. The course is designed to provide the student with experience in collecting and identifying local marine flora and fauna.			
BIMS 422			
BIOLOGY OF MARINE PLANKTON	2.0		
A study of the marine phytoplankton and zooplankton, their collection, analysis and interpretation. Their role in the ecosystem will be stressed as will be their distribution, particularly those of the near shore and estuarine environment. Field trips will be made to coastal New Jersey. Offered at the site of the New Jersey Marine Sciences Consortium. Cross listed with Earth and Environmental Studies, PHMS 422.			
BIMS 426			
MARINE ENERGY SYSTEMS	2.0		
Principles of production and energy transfer in the marine environment. Spatial and temporal distribution of productivity. Productivity measurement and assessment of the roles of plants, herbivores and carnivores in marine energetics. Offered at New Jersey Marine Sciences Consortium.			
BIMS 431			
MARINE INVERTEBRATE ZOOLOGY	4.0		
A study of the invertebrates living in the marine realm with emphasis on the interrelations of these animals to their particular environment. Field work will include studies of the pelagic and benthonic forms associated with estuaries and the continental shelf. Also offered at the site of the New Jersey Marine Sciences Consortium.			
BIMS 433			
SEASHORE ORNITHOLOGY	2.0		
Field identification of birds of the ocean, salt marsh, sand dunes, and adjacent land areas. Includes discussion of habits and ecology. Offered at NJ Marine Sciences Consortium.			
BIMS 438			
SEASHORE ENTOMOLOGY	2.0		
Ecological studies of the insect fauna found in the unique habitats of the (1) intertidal zone, (2) coastal sand dunes and (3) salt marsh found along the New Jersey shoreline.			
BIMS 450			
MARINE BOTANY	4.0		
An introduction to the structure, systematics, physiology and ecology of algae and metaphyta of the marine environment. Emphasis will be placed on the flora of the estuary and tidal marsh. Biology of the associated phytoplankton will be studied. Offered at the site of the New Jersey Marine Sciences Consortium. Cross listed with Earth and Environmental Studies, PHMS 450.			
BIMS 455			
MARSH AND DUNE VEGETATION	2.0		
A field and laboratory study of the plant communities that inhabit the sand dunes and marshes of the coastal zone of New Jersey. The diversity of the forms of plant life and their adaptations and ecological roles. The collection and identification of individual plant species. Also offered at the site of the New Jersey Marine Sciences Consortium.			
BIMS 460			
ADVANCED MARINE BIOLOGY	4.0		
Interrelationships of marine animals and plants. Ecological response to physical and chemical parameters. Principles such as zonation, succession, ecosystem structure, and physiological response will be examined through lectures, field projects and laboratory study.			
<i>Prerequisites: BIOL 112 and BIOL 113 (or BIOL 120 and BIOL 132 if completed prior to Fall 2002) or departmental approval.</i>			
BIMS 490			
FIELD METHODS IN THE MARINE SCIENCES	4.0		
The application and techniques of marine sampling, including those of biology, chemistry, geology, meteorology and physics. The nature and role of various pieces of sampling equipment. Field experience at the New Jersey Marine Sciences Consortium. (2 hours lecture; 4 hours lab.)			
BIMS 491			
PLANKTON SAMPLING AND ANALYSIS	1.0		
Sampling, identification and counting of phyto- and zooplankton. New Jersey Marine Sciences Consortium.			
BIMS 494			
PRIMARY PRODUCTION IN THE MARINE ENVIRONMENT	1.0		
Theory and techniques of primary production measurement. New Jersey Marine Sciences Consortium.			