Biotechnology

Associate in Applied Science Degree

Note: Biotechnology students requiring developmental courses in math must complete MAT-016 Intermediate Algebra prior to taking courses in Biology and Chemistry.

Biotechnology, the most rapidly growing sector in the field of biology and a major industry in New Jersey, is the application of the basic principles of the life sciences in the study of plants, animals, microbes, tissues, cells, biological molecules or a product that has a biological process attached to it. Students learn modern biotechnology methods and instrumentation and graduate with both theoretical knowledge and practical training and an Associate in Applied Science degree. Students are equipped with state-of-the-art skills including DNA fingerprinting, genetic engineering and HPLC, and are able to work at the technician level in research and pharmaceutical laboratories, molecular genetics, cosmetic/personal care product laboratories, biochemical, and food or animal care facilities. Graduates qualify for positions as biotechnology technicians, staff technologists, research assistants, microbiologists, histologists or cosmetic laboratory technologists. Students can make a choice for either direct employment and/or transfer to a four-year institution for a baccalaureate degree in biology or related scientific disciplines. Courses in this program are also ideal for retraining purposes.

Our Cooperative Education program (co-op) provides students the opportunity to gain valuable, practical skills working in industry as part of their educational experience.

For more information, visit the Biotechnology website.

Degrees

AAS Biotechnology
(P3330)

General Education Foundation

Communication 6
ENG-111 English Composition I
ENG-112 English Composition II
Math-Science-Technology 3
MAT-124 Statistics
Social Science or Humanities 3
Choose from General Education course list
General Education Electives 8
Choose from General Education course list
General Education Foundation Credits 20

Biotechnology Core

CHM-125 General Chemistry I - Lecture 3
CHM-126 General Chemistry I - Laboratory 1
CHM-127 General Chemistry II - Lecture 3
CHM-128 General Chemistry II - Laboratory 1
BIO-123 Cell Biology 4

BIO-215 Microbiology 4
CHM-212 Biochemistry 4
CHM-210 Essentials of Organic Chemistry (Summer) 4
CHM-220 Instrumental Methods of Analysis (Spring) 5
PHY-103 Concepts of Physics 4
Technical Elective 8
Free Electives 3
Biotechnology Core Credits 44
Total Credits 64

Students should consult with their academic advisors when selecting free electives.

Science courses completed by students prior to entering the Biotechnology program must have been taken within the past seven years. If the science courses exceed the seven-year limit, students can prove their competency by testing or they must retake the courses.

Faculty

Dr. Maria Isaza
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Biotechnology

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Courses

BIO-100. Elements in Biology. 3 Credits.
LECT 3 hrs
A foundation providing necessary skills and concepts needed to pursue the biology major. The course stresses skill development in areas such as communication, classification, inquiry, mathematical measurement, data analysis and report writing. Skills then are applied to the study of the cell cycle and diverse life processes. Additional Fees: Course fee applies.

BIO-101. Anatomy and Physiology I. 4 Credits.
LECT 3 hrs, LAB 3 hrs
The structure and function of the human organism is studied. Special emphasis is given to interrelationships of organs and organ systems. Cellular morphology and function are included for an appreciation of the adult form. The student is introduced to basic chemistry, the cell, basic tissues, the skeletal, muscular and nervous systems. Dissection is required as part of the laboratory syllabus. All remedial courses must be completed prior to taking this course. Prerequisites: Placement basis or ENG-007 or ENG-022 or ENG-025 and MAT-016 Additional Fees: Course fee applies.

BIO-102. Anatomy and Physiology II. 4 Credits.
LECT 3 hrs, LAB 3 hrs
A continuation of Anatomy and Physiology I. The circulatory, respiratory, digestive, urinary, endocrine and reproductive systems are studied. Dissection is required as part of the laboratory syllabus. All remedial courses must be completed prior to taking this course. Prerequisites: BIO-101 (Minimum grade of C) Additional Fees: Course fee applies.

BIO-116. Animal Control Officer’s Training Course. 3 Credits.
LECT 3 hrs
Preparation for New Jersey State Certification as an Animal Control Officer. Topics include legal authority for animal control (federal, state, local); courtroom procedures; animal behavior, capture and handling; disease recognition, prevention and control; shelter operations; and community relations.

BIO-118. Biomedical Ethics. 3 Credits.
LECT 3 hrs
This course introduces students to major ethical issues in areas of biomedicine in contemporary society. The focal point of the course is a process for ethical reasoning and ethical decision making. Students identify ethical problems, assess information relevant to decisions, identify stakeholders affected by decisions, recognize competing values, consider options, make decisions and realize the consequences of decisions. The process is applied to issues in such fields as genetics, death and dying, reproduction, public policy and medical decision making. This course does not fulfill a laboratory science requirement.

BIO-121. General Biology I. 4 Credits.
LECT 3 hrs, LAB 3 hrs
An introduction to the biological sciences through a study of concepts basic to the biology science major. Topics include the fundamentals of chemistry, cell structure and function, and the nature of biological molecules, bioenergetics, protein synthesis and photosynthesis. Dissection is required as part of the laboratory syllabus. All remedial courses must be completed prior to taking this course. Prerequisites: Placement basis or MAT-016 and ENG-007 or ENG-025 or ENG-022 Additional Fees: Course fee applies.

BIO-122. General Biology II. 4 Credits.
LECT 3 hrs, LAB 3 hrs
A continuation of General Biology I. Topics include homeostasis, animal reproduction, embryonic development, genetics, ecology and evolution. Dissection is required as part of the laboratory syllabus. All remedial courses must be completed prior to taking this course. Prerequisites: BIO-121 or BIO-180 (Minimum grade of C) Additional Fees: Course fee applies.

BIO-123. Cell Biology. 4 Credits.
LECT 3 hrs, LAB 3 hrs
Fall semester only. An introduction to the fundamentals of cellular biology. Topics covered are the nature of biologically important molecules, molecular synthesis, energetics, cellular structure and function, cell reproduction, heredity, and basic laboratory techniques for cellular study. All remedial courses must be completed prior to taking this course. Prerequisites: Placement basis or MAT-016 and ENG-007 or ENG-025 or ENG-022 Additional Fees: Course fee applies.
BIO-127. Biology of Environmental Concerns. 4 Credits.
LECT 3 hrs, LAB 3 hrs
Designed for the non-science major. A survey of ecological issues from a variety of perspectives. The course provides an awareness of environmental problems, a knowledge of cause-and-effect relationships of diverse activities on this planet and a basis for making informed judgments about the potential solutions to environmental problems. Major topics include the roots of our environmental problems, introductory concepts in ecology, human population dynamics and control, food resources and world hunger, renewable and nonrenewable energy resources, mineral resources and solid waste, wild plant and animal resources, water resources, air pollution, water pollution, pesticides and pest control, economics, politics and the environment, world views, and ethics and the environment. This course fulfills the general education laboratory science requirement.
Prerequisites: Placement basis or ENG-007 or ENG-022 or ENG-025
Additional Fees: Course fee applies.

BIO-132. Concepts in Biology. 4 Credits.
LECT 3 hrs, LAB 3 hrs
Designed for the non-science major. A basic introduction to the study of biological science. Topics include the hierarchy of organization, life processes, cell theory, human genetics, theories of evolution, biochemistry and some principles of ecology. This course fulfills the general education laboratory science requirement.
Prerequisites: Placement basis or ENG-007 or ENG-022 or ENG-025
Additional Fees: Course fee applies.

BIO-133. Human Biology. 4 Credits.
LECT 3 hrs, LAB 3 hrs
Designed for the non-science major. An introduction to the body systems and the factors which affect human physiology. Lectures include the basic anatomy and physiology of the major systems plus discussion topics emphasizing nutrition, exercise, sexuality, genetic engineering and recent advances in biotechnology. This course fulfills the general education laboratory science requirement.
Prerequisites: Placement basis or ENG-007 or ENG-022 or ENG-025
Additional Fees: Course fee applies.

BIO-180. General Biology I - Honors. 4 Credits.
LECT 3 hrs, LAB 3 hrs
Fall Semester only. This is an introduction to the biological sciences through a study of principles and concepts basic to the major discipline of biology. Topics include fundamentals of chemistry, cell structure and function, the nature of biological molecules, energetics, synthesis and the morphology and physiology of animals and plants. Dissection is required as part of the laboratory syllabus. Lecture and laboratory use an investigatory approach that emphasizes both written and oral communication skills.
Prerequisites: Placement basis or MAT-016 and ENG-007 or ENG-022 or ENG-025 and permission of department chair or honors advisor
Additional Fees: Course fee applies.

BIO-181. General Biology II - Honors. 4 Credits.
LECT 3 hrs, LAB 3 hrs
Spring Semester only. A continuation of BIO-180 General Biology I Honors. Topics include homeostasis, animal reproduction and embryonic development, genetics, ecology, and evolution. Dissection is required as part of the laboratory syllabus. Lecture and laboratory use an investigatory approach that emphasizes both written and oral communication skills.
Prerequisites: BIO-180 or BIO-121 and permission of honors advisor
Additional Fees: Course fee applies.

BIO-201. Genetics. 4 Credits.
LECT 3 hrs, LAB 3 hrs
Spring Semester only. Provides the student with a broad knowledge of genetics from the molecular to the organismal level. Topics covered include the molecular and Mendelian concepts of heredity and their relationship to cell function, development, population changes and evolution and biotechnology. Laboratory exercises emphasize a variety of techniques and skills used in genetic research and testing.
Prerequisites: BIO-121 and BIO-122 or BIO-180 and BIO-181 (Minimum grade of C required for all prerequisites)
Additional Fees: Course fee applies.

BIO-202. Ecology. 4 Credits.
LECT 3 hrs, LAB 3 hrs
Fall Semester only. This course introduces the basic fundamentals of ecology, the study of the interrelationships between organisms and their environment. Topics include an introduction to ecosystem structure and function, abiotic factors in ecosystems, energy flow and mineral cycling, population and evolutionary ecology, community ecology, a comprehensive survey of aquatic and terrestrial ecosystems, and human ecology. Laboratories and field trips are designed to introduce students to techniques used in basic ecological research.
Prerequisites: Minimum grade of C required for either BIO-121 or BIO-180 or LHT-110
Additional Fees: Course fee applies.

BIO-215. Microbiology. 4 Credits.
LECT 3 hrs, LAB 3 hrs
A comprehensive study of microorganisms, including viruses, bacteria, fungi, protozoa and algae. Topics covered include microbial anatomy, physiology, genetics, ecology and methods of control. Research methods and modern immunological concepts also are discussed. Laboratory exercises in basic microbiological techniques and the study of living microorganisms are designed to supplement the theory presented.
Prerequisites: Placement basis or ENG-007 or ENG-022 or ENG-025 and BIO-101 or BIO-121 or BIO-123 or BIO-180 (minimum grade of C) and CHM-117 or CHM-125 and CHM-126 (minimum grade of C)
Additional Fees: Course fee applies.

BIO-223. Cell and Molecular Biology. 4 Credits.
LECT 3 hrs, LAB 3 hrs
A comprehensive study of biological molecules and their functions. Emphasis will be placed on the mechanism and regulation of macromolecule synthesis. Laboratory exercises will focus on instrumentation and techniques used in biological research.
Prerequisites: BIO-121 or BIO-123 and CHM-125 and CHM-126
Minimum grade of C required for all prerequisites
Additional Fees: Course fee applies.
BIO-226. Cooperative Work Experience - Biology. 3 Credits.
COOP 3 hrs
This course provides selected students enrolled in the Biotechnology or Biology Major with job-oriented laboratory training and practical work experience in an unpaid work environment prior to career employment. Students work a minimum of 135 hours. Students desiring to participate in this experience should make their interest known to the department chairperson by the end of their second semester. Offered Fall, Spring and Summer, day.
Prerequisites: Fourth semester status as a Biotechnology or Biology major and permission of department chair.

BIO-228. Internship Work Experience - Biology. 3 Credits.
COOP 3 hrs
This course provides selected students enrolled in the Biotechnology or Biology Major with job-oriented laboratory training and practical work experience in an unpaid work environment prior to career employment. Students work a minimum of 135 hours. Students desiring to participate in this experience should make their interest known to the department chairperson by the end of their second semester. Offered Fall, Spring and Summer, day.
Prerequisites: Fourth semester status as a Biotechnology or Biology major and permission of department chair.

BIO-233. Independent Study in Biology. 3 Credits.
LECT 3 hrs
An opportunity for selected students to participate in biological research under close supervision of the biology faculty. Interested students should make their interest known early in the prior semester to the department chair, who will familiarize the students with criteria for selection and the steps to be taken to gain entrance to this course. This course does not fulfill any of the science requirements in biology but is offered as a free elective.
Prerequisites: Permission of department chair
Additional Fees: Course fee applies.

BIO-274. Pathophysiology. 3 Credits.
LECT 3 hrs
Pathophysiology is a course which studies the physiological alterations associated with common disease processes which affect human beings across the lifespan. Common diseases of the major organ systems are covered as well as such general issues as infection, neoplasm, inflammation, fluid and electrolyte imbalance, trauma, and shock.
Prerequisites: BIO-101 and BIO-102 and CHM-117 Minimum grade of C required for all prerequisites.

BIO-295. Special Topics in Biology. 4 Credits.
LECT 4 hrs
An examination of selected topics or issues in biology. Topics may differ each time the course is offered. Students should consult the department chair for further information.
Prerequisites: An introductory course in Biology and permission of department chair
Additional Fees: Course fee applies.

CHM-100. Elements of Chemistry. 3 Credits.
LECT 3 hrs
A one-semester, introductory 3-credit, non-laboratory course designed for students with little or no background in chemistry. Emphasis is on preparing students for General Chemistry and Introductory Chemistry courses. The course encompasses chemical principles and calculations with a brief review of algebra.
Prerequisites: MAT-016 - minimum grade of C required.

CHM-105. Forensic Science. 4 Credits.
LECT 3 hrs, LAB 3 hrs
Designed for the non-science major. An introduction to the applications of the physical and biological sciences in analyzing and evaluating physical evidence as related to crime and the law.
Additional Fees: Course fee applies.

CHM-117. Introductory Chemistry Lecture. 3 Credits.
RECI 1 hr, LECT 3 hrs
An introduction to the basic concepts of inorganic, organic and biochemistry. The emphasis is on the relationship of these concepts to physiological chemistry and living systems. All remedial courses listed must be completed prior to taking this course.
Prerequisites: Placement basis or MAT-016 (minimum grade of C) and ENG-025 or ENG-022 or ENG-007
Corequisites: CHM-118.

CHM-118. Introductory Chemistry Laboratory. 1 Credit.
LAB 3 hrs
Laboratory experiments illustrate principles studied in CHM-117. Required for Landscape and Horticultural Technology, liberal arts majors and some Allied Health programs.
Prerequisites: Placement basis or MAT-016 (minimum grade of C) and ENG-025 or ENG-022 or ENG-007
Corequisites: CHM-117
Additional Fees: Course fee applies.

CHM-125. General Chemistry I - Lecture. 3 Credits.
RECI 1 hr, LECT 3 hrs
A study of the fundamental principles of chemistry and their application to chemical reactions. Topics include the structure of the atom, concepts of matter, mass relationships for pure substances and chemical reactions, solutions, electronic structure, the chemical bond, nuclear reactions and gases. All remedial courses listed must be completed prior to taking this course.
Prerequisites: Placement College Level Math test or MAT-110 (minimum grade of C) and Placement basis or ENG-025 or ENG-022 or ENG-007
Corequisites: CHM-126.

CHM-126. General Chemistry I - Laboratory. 1 Credit.
LAB 3 hrs
Laboratory experiments illustrate principles studied in CHM-125. All remedial courses listed must be completed prior to taking this course.
Prerequisites: Placement College Level Math test or MAT-110 (minimum grade of C) and Placement basis or ENG-025 or ENG-022 or ENG-007
Corequisites: CHM-125
Additional Fees: Course fee applies.

CHM-127. General Chemistry II - Lecture. 3 Credits.
RECI 1 hr, LECT 3 hrs
A continuation of General Chemistry I with emphasis on chemical equilibrium and energy changes in chemical reactions. Also included are acids, bases, buffers, chemical thermodynamics, kinetics, qualitative analysis and electrochemistry. All remedial courses listed must be completed prior to taking this course.
Prerequisites: CHM-125 (minimum grade of C), CHM-126 and placement basis or ENG-025 or ENG-022 or ENG-007
Corequisites: CHM-128.
CHM-128. General Chemistry II - Laboratory. 1 Credit.
LAB 3 hrs
Laboratory experiments illustrate principles studied in CHM-127. All remedial courses listed must be completed prior to taking this course.
Prerequisites: CHM-125 and CHM-126 (minimum grade of C required for both) and placement basis or ENG-007 or ENG-022 or ENG-025
Corequisites: CHM-127
Additional Fees: Course fee applies.

CHM-136. Environmental Regulation. 3 Credits.
LECT 3 hrs
This course is an overview of critical environmental issues encountered by industry from a regulatory perspective. Various federal and New Jersey state regulations pertaining to air, water, hazardous waste and hazardous materials management are investigated. Students acquire knowledge on how industry complies with the diversity of regulatory requirements. Students are exposed to examples of instances where industrial non-compliance with applicable regulations has led to deleterious environmental and occupational health effects. Current issues and their significance to environmental and occupational health are discussed including, Clean Water Act, Clean Air Act, Environmental Cleanup and Responsibility Act (ECRA), Resource Conservation and Recovery Act (RCRA), Occupational Safety and Health Act (OSHA), Toxic Substance Control Act (TSCA), Asbestos, indoor air quality and underground storage tanks.
Prerequisites: BIO-123 and CHM-125.

CHM-204. Principles of Occupational Health and Safety. 3 Credits.
LECT 3 hrs
A survey course providing an overview of industrial hygiene and the roles that the industrial hygiene professional plays in recognizing, evaluating and controlling hazards in the workplace. This course provides an introduction to the qualitative and quantitative issues essential to comprehend occupational safety and health principles. Case studies and hands-on exercises are utilized to stress key concepts.

CHM-210. Essentials of Organic Chemistry. 4 Credits.
LECT 3 hrs, LAB 3 hrs
Summer Semester only. This course is the study of the basic principles of structure, reactivity and nomenclature in organic chemistry. The laboratory develops basic work skills in the types of experiments performed in a typical organic chemistry laboratory with emphasis on the safe handling of laboratory chemicals and the proper presentation of experimental results.
Prerequisites: CHM-117 and CHM-118 or CHM-127 and CHM-128 (minimum grade of C for all prerequisites)
Additional Fees: Course fee applies.

CHM-212. Biochemistry. 4 Credits.
LECT 3 hrs, LAB 3 hrs
An introduction to physiological chemistry. Lectures cover amino acids, proteins, lipids, nucleic acids, carbohydrates, molecular genetics, energetics and metabolic pathways. Lab reinforces concepts covered in lecture. All remedial courses listed must be completed prior to taking this course.
Prerequisites: Placement basis or ENG-025 or ENG-022 or ENG-007 and CHM-117 (minimum grade of C) or CHM-125 (minimum grade of C)
Additional Fees: Course fee applies.

CHM-219. Quantitative Chemical Analysis. 5 Credits.
LECT 3 hrs, LAB 6 hrs
Fall Semester only. Principles of modern quantitative methods in chemistry, including the study of chemical equilibria, solubility, acidity and complex formation. The laboratory work involves practical applications of inorganic and organic analysis including volumetric, gravimetric, chromatographic and instrumental techniques. Emphasis is placed on the statistical treatment of data and report writing. All remedial courses listed must be completed prior to taking this course.
Prerequisites: Placement basis or ENG-025 or ENG-022 or ENG-007 and CHM-127 (minimum grade of C) or equivalent
Additional Fees: Course fee applies.

CHM-220. Instrumental Methods of Analysis. 5 Credits.
LECT 3 hrs, LAB 6 hrs
Spring Semester only. This survey course covers theory and applications of modern instrumentation utilized to solve problems in chemical analysis. Laboratory work involves hands-on experience utilizing instruments such as gas(GC), liquid(HPLC) and ion chromatography; spectrophotometric methods including visible, ultraviolet, infrared(FTIR) and atomic absorption; ICP and other methods, including ion selective electrode methods; and electrophoretic methods including capillary electrophoresis(HPCE). Emphasis is placed on the comparison of methods, the collection and interpretation of laboratory data, technical report writing and record keeping. All remedial courses listed must be completed prior to taking this course.
Prerequisites: Placement basis or ENG-025 or ENG-022 or ENG-007 and CHM-127 or equivalent (minimum grade of C)
Additional Fees: Course fee applies.

CHM-228. Cooperative Work Experience - Chemistry. 3 Credits.
COOP 3 hrs
This course provides selected students enrolled in the Chemical Technology or Chemistry programs with job-oriented laboratory training and practical work experience in a paid work environment prior to career employment. Students work a minimum of 135 hours. Students desiring to participate in this experience should make their interest known to the department chair by the end of their second semester. Offered Fall, Spring and Summer, day.
Prerequisites: Fourth semester status as a Chemical Technology or Chemistry major and permission of department chair.

CHM-229. Internship Work Experience - Chemistry. 3 Credits.
COOP 3 hrs
This course provides selected students enrolled in the Chemical Technology or Chemistry Major with job-oriented laboratory training and practical work experience in an unpaid work environment prior to career employment. Students work a minimum of 135 hours. Students desiring to participate in this experience should make their interest known to the department chairperson by the end of their second semester. Offered Fall, Spring and Summer, day.
Prerequisites: Fourth semester status as a Chemical Technology or Chemistry major and permission of department chair.
CHM-231. Organic Chemistry I - Lecture. 3 Credits.
LECT 3 hrs
This course is an introduction to the chemistry of carbon compounds. Topics include a study of the fundamental concepts of structure and stereochemistry, physical properties of organic compounds, and a functional approach to the interpretation of organic reactions. This course is designed for majors in Biology, Chemistry, Pharmacy, and for students preparing for medical, dental, and veterinary schools. All remedial courses listed must be completed prior to taking this course.
Prerequisites: Placement basis or ENG-025 or ENG-022 or ENG-007 and CHM-127 (minimum grade of C) and CHM-128 (minimum grade of C)
Corequisites: CHM-232.

CHM-232. Organic Chemistry I - Laboratory. 1 Credit.
LAB 3 hrs
Laboratory experiments stress techniques involved in the synthesis and purification of typical organic compounds using both macroscale and microscale techniques. All remedial courses listed must be completed prior to taking this course.
Prerequisites: Placement basis or ENG-025 or ENG-022 or ENG-007 and CHM-127 (minimum grade of C) and CHM-128 (minimum grade of C)
Corequisites: CHM-231
Additional Fees: Course fee applies.

CHM-233. Organic Chemistry II - Lecture. 3 Credits.
LECT 3 hrs
A continuation of the study of organic compounds with further study of functional groups, reaction mechanisms including nucleophilic substitution and elimination reactions, and infrared and nuclear magnetic resonance spectroscopy. All remedial courses listed must be completed prior to taking this course.
Prerequisites: CHM-231 (minimum grade of C) and CHM-232 (minimum grade of C)
Corequisites: CHM-234.

CHM-234. Organic Chemistry II - Laboratory. 1 Credit.
LAB 3 hrs
Laboratory experiments involve the multi-step synthesis of organic compounds, which illustrate the principles of CHM-233, using macroscale and microscale techniques. All remedial courses listed must be completed prior to taking this course.
Prerequisites: CHM-231 (minimum grade of C) and CHM-232 (minimum grade of C)
Corequisites: CHM-233
Additional Fees: Course fee applies.

CHM-235. Independent Study in Chemistry. 3 Credits.
LECT 3 hrs
This course is an opportunity for selected students to participate in independent research under close supervision of a Chemistry faculty member. Interested students should make their interest known early in the prior semester to the department chair who will detail the criteria for selection.
Prerequisites: Permission of department chair
Additional Fees: Course fee applies.

CHM-236. Special Topics in Chemistry. 4 Credits.
LECT 3 hrs, LAB 3 hrs
An examination of selected topics or issues in chemistry. Topics may differ each time the course is offered. Students should consult the department chair for further information.
Prerequisites: An introductory course in Chemistry and permission of department chair
Additional Fees: Course fee applies.

CHM-295. Special Topics in Chemistry. 3 Credits.
LECT 3 hrs
An examination of selected topics or issues in chemistry. Topics may differ each time the course is offered. Students should consult the department chair for further information.
Prerequisites: An introductory course in Chemistry and permission of department chair.