

Chemical Technology

Associate in Applied Science Degree

Note: Chemical technology students requiring developmental courses in math must complete MAT-016 Intermediate Algebra or MAT-026 Intermediate Algebra Express prior to taking courses in Biology and Chemistry.

The chemical industry, a major New Jersey employer, is important for the creation and manufacturing of basic items such as pharmaceuticals, cosmetic/personal care products, gasoline, plastics, fabrics and foods. Chemical Technology is an ideal program of study for students who are interested in this field and desire a more practical hands-on approach to learning. Students learn to use gas chromatography (GC), high-performance liquid chromatography (HPLC), Fourier-transform infrared spectroscopy (FTIR) and other state-of-the-art equipment, as well as modern wet chemical techniques.

Chemical Technology graduates earn an Associate in Applied Science degree, which provides them with the theoretical and technical expertise to be employed at the technician level in research laboratories, quality control labs, pilot plants, chemical production and environmental-monitoring facilities and testing labs. The department works collaboratively with Career Services in providing opportunities to our students for paid and unpaid internships. Graduates can choose to transfer to a four-year institution for a baccalaureate degree in chemistry or related scientific disciplines. Courses in this program are also ideal for retraining purposes.

For more information, visit the [Chemical Technology \(http://www.ccm.edu/academics/divdep/health-professions-natural-sciences/department-of-biology-and-chemistry/chemical-technology/\)](http://www.ccm.edu/academics/divdep/health-professions-natural-sciences/department-of-biology-and-chemistry/chemical-technology/) website.

Degrees

- AAS Chemical Technology (p. 1)
- AAS Chemical Technology - Environmental Science Option (p. 1)

AAS Chemical Technology

(P3450)

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 (Humanities/Social Science)	
General Education Electives	9
Choose from General Education course list	
General Education Foundation Credits	21
Chemical Technology 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-121	General Biology I	4
BIO-122	General Biology II	4
CHM-218	Analytical Chemistry - Instrumental Analysis	4
CHM-210	Essentials of Organic Chemistry (Summer)	4
PHY-103	Concepts of Physics	4
Technical Electives		11
Chemical Technology Core Credits		39
Total Credits		60

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

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

Environmental Science

An Option within Chemical Technology

(P3451)

Note: Environmental Science students requiring developmental courses in math must complete MAT-016 Intermediate Algebra or MAT-026 Intermediate Algebra Express prior to taking courses in Biology and Chemistry.

The Environmental Science option is a two-year degree program designed for students who plan to enter the rapidly growing field of environmental science. The curriculum stresses the interdisciplinary nature of ecological problems and provides students with a wide range of courses necessary to prepare them for the environmental challenges of the 21st century.

Graduates have the theoretical and technical expertise required to enter positions at the technician level in diversified fields such as water pollution control; environmental analysis of water, air and soil; hazardous waste management; site remediation (cleanup); and a variety of other areas. The program also provides several introductory courses which may be transferable to a four-year degree program in environmental science.

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 (Humanities/Social Science)	
General Education Electives	9
Choose from General Education course list	

General Education Foundation Credits	21
Environmental Science 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-121 General Biology I	4
BIO-122 General Biology II	4
BIO-202 Ecology	4
CHM-210 Essentials of Organic Chemistry	4
CHM-218 Analytical Chemistry - Instrumental Analysis	4
PHY-103 Concepts of Physics	4
Technical Electives	7
Environmental Science Core Credits	39
Total Credits	60

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

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

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Courses

BIO-101. Anatomy and Physiology I. 4 Credits.

LECT 3 hrs LAB 3 hrs

The structure and function of the human organism are 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 integumentary, 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 MAT-016 or MAT-026

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-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

This is an introduction to the biological sciences through a study of principles and concepts basic to the major discipline of biology. Topics include the 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.

Prerequisites: Placement basis or MAT-016 or MAT-026

Corequisites: ENG-111 or ENG-111CL or ENG-111CW

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, animal physiology, 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-127. Biology of Environmental Concerns. 4 Credits.

LECT 3 hrs LAB 3 hrs

Designed for the non-science major. A survey of environmental 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 non-renewable 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, worldviews, ethics, and the environment. This course fulfills the general education laboratory science requirement. This course requires field exercises that may include moderate physical activity.

Additional Fees: Course fee applies.

BIO-129. Introduction to Botany. 4 Credits.

LECT 3 hrs LAB 2 hrs

Botany includes studying the effects of the environment on plant growth and development, plant morphology and physiology, and plant classification. Students apply theory by propagating, maintaining and studying plants using the Landscape and Horticultural Technology laboratories and greenhouse facilities.

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.

Additional Fees: Course fee applies.

BIO-133. Human Biology. 4 Credits.

LECT 3 hrs LAB 3 hrs

Designed for the non-science majors or for those students enrolled in Curriculum 2160, Nutrition Track. It is an introduction to the body systems and the factors that affect human physiology. Lectures include 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.

Corequisites: ENG-111 or ENG-111CL or ENG-111CW

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 which will emphasize both written and oral communication skills.

Prerequisites: Placement basis or MAT-016 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

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. This course requires field exercises that may include moderate physical activity.

Prerequisites: Minimum grade of C required for BIO-121 and BIO-122 or BIO-180 and BIO-181 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: BIO-101 or BIO-121 or BIO-180 (minimum grade of C) and CHM-117 or CHM-125 (minimum grade of C)

Corequisites: ENG-111 or ENG-111CL or ENG-111CW

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-228. Internship Work Experience - Biology. 3 Credits.

COOP 3 hrs

This comprehensive course provides selected students enrolled in the Biology Major with job-oriented laboratory training and practical work experience in a paid or unpaid work environment prior to career employment. The course requires a detailed description of the proposed internship, workplace attendance, regular communication with the faculty advisor, an oral presentation, a written final report, and a closing interview describing the student's work experience. 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. This course is treated as a free elective for Biology majors.

Prerequisites: Permission of department chair.

BIO-229. Internship Work Experience. 2 Credits.

COOP 2 hrs

This intermediate-level course is a free elective for Biology majors providing pre-professional work experience and laboratory training in a paid or unpaid work environment. Students work a minimum of 90 hours. Course completion requires a detailed description of the proposed internship, workplace attendance, frequent communication with the faculty advisor, a written final report, and a closing interview describing the student's work experience. Students should inquire with the department chairperson by the end of their second semester for registration.

Prerequisites: Permission of department chair.

BIO-230. Internship Work Experience - Biology Internship 1 Credit. 1 Credit.

COOP 1 hr

This introductory course provides Biology Majors with career-oriented work experience and laboratory training and in a paid or unpaid work environment prior to career employment. The course requires a detailed description of the proposed internship, workplace attendance, frequent communication with the faculty advisor, and a written final report describing the student's work experience. Students desiring to participate in this free elective should make their interest known to the department chairperson by the end of their second semester. Students work a minimum of 45 hours.

Prerequisites: 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 3 hrs LAB 2 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-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) or MAT-026.

CHM-118. Introductory Chemistry Laboratory. 1 Credit.

LAB 3 hrs

Laboratory experiments illustrate principles studied in CHM 117 (Introductory Chemistry Lecture).

Prerequisites: Placement basis or MAT-016 (minimum grade of C) or MAT-026

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.

Prerequisites: Placement College Level Math test or MAT-110 (minimum grade of C)

Corequisites: CHM-126.

CHM-126. General Chemistry I - Laboratory. 1 Credit.

LAB 3 hrs

Laboratory experiments illustrate principles studied in CHM-125.

Prerequisites: Placement College Level Math test or MAT-110 (minimum grade of C)

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.

Prerequisites: CHM-125 (minimum grade of C)

Corequisites: CHM-128.

CHM-128. General Chemistry II - Laboratory. 1 Credit.

LAB 3 hrs

Laboratory experiments illustrate principles studied in CHM-127.

Prerequisites: CHM-125 and CHM-126 (minimum grade of C required for both)

Corequisites: CHM-127

Additional Fees: Course fee applies.

CHM-210. Essentials of Organic Chemistry. 4 Credits.

LECT 3 hrs LAB 3 hrs

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-125 and CHM-126 (minimum grade of C for all prerequisites)

Corequisites: ENG-111 or ENG-111CL or ENG-111CW

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: CHM-117 (minimum grade of C) or CHM-125 (minimum grade of C)

Corequisites: ENG-111 or ENG-111CL or ENG-111CW

Additional Fees: Course fee applies.

CHM-218. Analytical Chemistry - Instrumental Analysis. 4 Credits.

LECT 3 hrs LAB 3 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: ENG-111 or ENG-111CL or ENG-111CW and CHM-127 or equivalent (minimum grade of C)

Additional Fees: Course fee applies.

CHM-229. Internship Work Experience - Chemistry. 3 Credits.
COOP 3 hrs

This comprehensive course provides selected students enrolled in the Chemical Technology or Chemistry Major with job-oriented laboratory training and practical work experience in a paid or unpaid work environment prior to career employment. Students work a minimum of 135 hours. The course requires a detailed description of the proposed internship, workplace attendance, regular communication with the faculty advisor, an oral presentation, a written final report, and a closing interview describing the student's work experience. Students desiring to participate in this experience should make their interest known to the department chairperson by the end of their second semester. This course is a technical elective for Chemical Technology majors and a free elective for Chemistry majors.

Prerequisites: Permission of department chair.

CHM-230. Internship Work Experience - Chemistry 2 Credits. 2 Credits.
COOP 2 hrs

This intermediate-level course provides Chemical Technology or Chemistry majors with career-oriented laboratory training and practical work experience in a paid or unpaid work environment. The course requires a detailed description of the proposed internship, workplace attendance, frequent communication with the faculty advisor, a written final report, and a closing interview describing the student's work experience. Students work a minimum of 90 hours. Chemical Technology majors can take this course as a technical elective and Chemistry majors may take it as a free elective. Students desiring to participate in this experience should make their interest known to the department chairperson by the end of their second semester.

Prerequisites: 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.

Prerequisites: CHM-127 (minimum grade of C) and CHM-128 (minimum grade of C)

Corequisites: CHM-232 and ENG-111 or ENG-111CL or ENG-111CW.

CHM-232. Organic Chemistry I - Laboratory. 1 Credit.
LAB 3 hrs

This course performs laboratory experiments to illustrate principles taught in CHM 231, which stress techniques involved in the analysis, synthesis, and purification of typical organic compounds.

Prerequisites: CHM-127 (minimum grade of C) and CHM-128 (minimum grade of C)

Corequisites: CHM-231 and ENG-111 or ENG-111CL or ENG-111CW

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. Internship Work Experience - Chemistry Credits. 1 Credit.
COOP 1 hr

This introductory course offers interested students enrolled in the Chemical Technology or Chemistry Major with preprofessional laboratory training and practical work experience in a paid or unpaid work environment prior to career employment. The course requires a detailed description of the proposed internship, workplace attendance, frequent communication with the faculty advisor, and a written final report describing the student's work experience. Students desiring to participate in this experience should make their interest known to the department chairperson by the end of their second semester. Students work a minimum of 45 hours.

Prerequisites: Permission of department chair.

CHM-295. 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-296. 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.