

Biotechnology

Associate in Applied Science

Minimum of 67-69 credit hours

This program is designed to train students to be skilled biotechnology technicians. Students will be educated in the fundamentals of biology and chemistry with special emphasis on molecular biology and its utilization in separation techniques, gene splicing, recombinant DNA, fermentation and cell development and production processes used in many areas of human health, plant and animal agriculture, pharmaceuticals, food processing, cosmetic and household products, environmental technology, and bioremediation.

Course Sequence

Course ID	Course Name	Credits	Type	Min Gd
Suggested Freshman 1st Semester				
SCL 1001	Success in College and Life	1	Life Skills	
ENGL 1113	English Composition I	3	Gen Ed	
MATH 1513	College Algebra for Business, Life Sciences and Social Sciences	3	Gen Ed	
CHEM 1115	General Chemistry I	5	Gen Ed	
BIO 1124	General Biology I (Majors)	4	Major	
BIOT 1011	Survey of Biotechnology	1	Major	
Suggested Freshman 2nd Semester				
MATH 2013	Introduction to Statistics	3	Gen Ed	
ENGL 1213	English Composition II	or	Gen Ed	
COM 1123	Interpersonal Communications	or	Gen Ed	
COM 2213	Intro to Public Speaking	3	Gen Ed	
CHEM 1215	General Chemistry II	5	Support	
BIO 2125	Microbiology	5	Major	
BIOT 1022	Media and Solution Preparation	2	Major	
Suggested Sophomore 1st Semester				
POLSC 1113	American Federal Government	3	Gen Ed	
CHEM 2114	Organic Chemistry I	4	Gen Ed	
BIOT 2843	Advanced Nucleic Acid Laboratory	3	Major	
BINFO 1011	Introduction to Bioinformatics	1	Major	
BIOT 2823	Biotechnology Laboratory I	3	Major	
BIO 2203	Cell Biology	3	Major	
Suggested Sophomore 2nd Semester				
BIO 2234	Human Physiology	4	Major	
HIST 1483	U.S. History to The Civil War	or	Gen Ed	
HIST 1493	U.S. History Since The Civil War	3	Gen Ed	
BIOT 2352	Immunology	2	Major	
BIOT 2933	Biotechnology Laboratory II	3	Major	
BIOT 2921	Cell Culture Methods	1	Major	
BIOT 2942	Biomanufacturing	2	Major	
Suggested Sophomore Summer Semester				
BIOT 2993	Biotechnology Internship	3	Major	

Course Grouping

Major Courses: (34-35 credit hours) Biology: BIO 1124; BIO 2125; BIO 2234; BINFO 1011; Biotechnology: BIOT 1011; BIOT 1022; BIOT 2352; BIOT 2823; BIOT 2933; BIOT 2921; BIOT 2993; * Pick 2 of the following 3: BIO 2203, BIOT 2843, BIOT 2942

General Education Courses: (20 credit hours) Chemistry: CHEM 1115; Communications: ENGL 1113 and one of the following: ENGL 1213; COM 1123; COM 2213; History: HIST 1483 or HIST 1493; Political Science: POLSC 1113; Mathematics: MATH 2013

Life Skills Courses: (1 credit hour) Life Skills: SCL 1001

Support Courses: (12 credit hours) Chemistry: CHEM 1215; CHEM 2114; MATH 1513

Program Notes

Notes: This Technical and Occupational program is designed to prepare students to enter the job force following completion. See Technical and Occupational Programs in the general information section of the catalog.

Degree Program Course Descriptions

BINFO 1011 - Introduction to Bioinformatics

Prerequisites: Math 0103 or adequate math placement test score and ENGL 0203, adequate placement score, or by meeting determined placement measures

1 Credit Students are introduced to the field of bioinformatics. They will explore the field of bioinformatics in a comprehensive overview, which includes ethics, as well as current trends in bioinformatics careers and applications.

BIO 1124 - General Biology I (Majors)

Prerequisites: ENGL 0203 or adequate placement score or by meeting determined placement measures; MATH 0403 or adequate math placement test score.

4 Credits An introductory course required for all biological science majors and pre-health profession students. The fundamental principles of biology are described using a cellular approach. Students gain knowledge regarding the chemical basis of life, structural characteristics of cells to include a discussion of energetics, metabolism and genetics. Evolution and ecology are also discussed in order to provide an understanding of both the diversity of living organisms and the living world. Students recognize, discuss and correctly apply fundamental biological principles influencing their personal relationship with other life forms. A discussion of the scientific method, logical (deductive) reasoning, hypothesis testing and some common fallacies and misconceptions that cloud scientific explanations of the natural world are included. Laboratory work, an integral and required part of the course, will enhance the student's understanding of fundamental biological concepts as well as scientific procedures, laboratory technical skills, dissection and statistical analysis.

BIO 2125 - Microbiology

Prerequisites: MATH 0203 or adequate math placement test score, Any four credit hour college-level biology course and a college-level chemistry course.

5 Credits Students are introduced to the biological requirements and activities of microorganisms which influence their roles as integral components of the ecosystem. Students demonstrate knowledge of basic principles of pathology, epidemiology and immunology in addition to performing basic laboratory techniques for isolating, characterizing and identifying common microorganisms.

BIO 2203 - Cell Biology

Prerequisites: BIO 1124

3 Credits Students are introduced to the basic features of cells and methods of studying them. Emphases are on cellular chemistry, structure, functions of organelles and processes. Students will demonstrate knowledge of the mechanisms of cellular processes, energetics, reproduction and differentiation.

BIO 2234 - Human Physiology

Prerequisites: BIO 1124 and one college-level chemistry course.

4 Credits Students discuss major systems of the human body, contrast functional and regulatory activities of each and identify factors influencing homeostasis. Through the use of models, the student will recognize the relative influences and interrelationships between circulation, digestion, metabolism, respiration, kidney function, muscle action, endocrine and nervous control, and reproduction of other systems and the organism as a whole. Laboratory work which requires dissection is an integral and required part of the course.

BIOT 1011 - Survey of Biotechnology

Prerequisites: Math 0203 or adequate math placement test score and ENGL 0203, adequate placement score, or by meeting determined placement measures

1 Credit The student will explore the field of biotechnology in a comprehensive overview. Course topics will include ethics, current trends in biotechnology careers and research through demonstrations, seminars, and field-trips.

BIOT 1022 - Media and Solution Preparation

Prerequisites: College biology, CHEM 1115; Corequisite: BIO 2125

2 Credits The student will prepare media and solutions, use calculations required for solution preparation, and use equipment for solution preparation such as the analytical balance, pH meter, and autoclave.

BIOT 2352 - Immunology

Prerequisites: BIO 2125

2 Credits The student will discuss the nonspecific and specific immune systems of the human organism. Course topics will include antigen-antibody interaction, cell-mediated immunity, interferon, natural killer cells, and complement.

BIOT 2823 - Biotechnology Laboratory I

Prerequisites: MATH 2013 or MATH 1513, BIOT 1022; Corequisite: BIO 2343, CHEM 1215

3 Credits Students become familiar with recombinant DNA techniques and gene expression. Students work with genomic and plasmid DNA, transfer, select for, identify, characterize, quantify, amplify, and purify DNA. Experience with electrophoresis, polymerase chain reaction, plasmid preps, and bioinformatics will be included.

BIOT 2843 - Advanced Nucleic Acid Laboratory

Prerequisites: BIOT 2823

3 Credits Students build on the skills learned in Biotechnology Laboratory I to explore more advanced DNA and RNA techniques.

BIOT 2921 - Cell Culture Methods

Prerequisites: BIO 2125; BIOT1022

1 Credit The student will learn to successfully maintain mammalian culture cells in a healthy uncontaminated state for an extended period of time. The course will include making cell culture media, monitoring cell growth, freezing cells, and bringing up frozen cells.

BIOT 2933 - Biotechnology Laboratory II

Prerequisites: BIOT 2823

3 Credits The student will characterize, quantify and partially purify proteins with a variety of methods. Immunochemistry will be examined including ELISA and Western Blot.

BIOT 2942 - Biomanufacturing

Prerequisites: BIOT 2823 and BIOT 2933

2 Credits The student will use a biofermenter to grow and monitor cells on a laboratory scale that simulates the large-scale production used in industry. Students will clean, sterilize, inoculate, operate and monitor the fermenter and then recover and purify protein products. Principles of upstream and downstream processing in the manufacture of a protein product using current Good Manufacturing Practices (cGMPs) and following Standard Operating Procedures (SOPs) will be emphasized.

BIOT 2993 - Biotechnology Internship

Prerequisites: BIOT 2933, BIOT 2921

3 Credits Students receive 320 hours of practical experience at one of the affiliated corporations or a university research facility. The techniques learned in BIOT 2823, BIOT 2933 and BIOT 2921 will be applied in an actual research setting to give the student more experience while learning practical applications for laboratory procedures.

CHEM 1115 - General Chemistry I

Prerequisites: ENGL 0203, adequate placement score, or by meeting determined

placement measures; MATH 1513 or MATH 1533, or both MATH 0403 and High School Chemistry or CHEM 1123. A grade of 5 Credits This course is designed for science and engineering majors. The course covers nomenclature, atomic and molecular structure, stoichiometry, acid/base and other aqueous reactions, states of matter, phase changes, gas laws, and an introduction to thermochemistry. Laboratory experience is an integral part of the course.

CHEM 1215 - General Chemistry II

Prerequisites: CHEM 1115 with a grade of "C" or better; MATH 1513 or MATH 1533 with a grade of "C" or better.

5 Credits This course is a continuation of CHEM 1115 with emphasis on thermochemistry, intermolecular forces, properties of solutions, acid/base properties, kinetics, equilibrium, thermodynamics, electrochemistry, and organic chemistry. Laboratory is an integral part of the course.

CHEM 2114 - Organic Chemistry I

Prerequisites: CHEM 1215 with a grade of "C" or better.

4 Credits This course is the first of a two-semester sequence of organic chemistry for science and chemical engineering majors as well as students seeking to enter the fields of medicine, dentistry, pharmacy, and veterinary medicine. Students will master the fundamental concepts of structure, functional groups, and reactions of aliphatic compounds along with selected reaction mechanisms.

COM 1123 - Interpersonal Communications

Prerequisites: ENGL 0203, adequate placement score, or by meeting determined placement measures

3 Credits The student will be able to identify why certain things happen as they do when two or more individuals come together to communicate for a specific purpose. The student must attest to his or her ability to understand the principles of interpersonal communication with emphasis on dyads, small groups, analysis of communication models and nonverbal communication, applying understanding to the major types of interpersonal communication problems in the work environment and in daily human relations.

COM 2213 - Intro to Public Speaking

Prerequisites: ENGL 0106 or adequate placement score

3 Credits Given the principles of effective listening and speaking, the student will assimilate those skills into his or her physical and psychological worlds. After being exposed to public, business and professional speaking, the student will apply the principles of invention, organization, style, and delivery

through practical exercises and will use the principles of rhetorical criticism in discussing speeches delivered in class.

ENGL 1113 - English Composition I

Prerequisites: ENGL 0203, adequate placement score, or by meeting determined placement measures

3 Credits The student will write well-developed compositions which demonstrate the principles of unity, coherence, and organization and which contain specific details and vivid language. The students will locate library material and incorporate researched materials into compositions.

ENGL 1213 - English Composition II

Prerequisites: ENGL 1103 or ENGL 1113 taken within the last year, with strong encouragement for immediate continuation.

3 Credits In this advanced writing course, students will create essays that explore and evaluate a variety of issues and perspectives suggested by fiction, poetry, drama, essays, and other types of cultural texts. Students will refine and augment the writing techniques they learned in ENGL 1113 or ENGL 1103 to develop well-reasoned, well-structured arguments in a clear, fluid, and engaging prose style.

HIST 1483 - U.S. History to The Civil War

Prerequisites: ENGL 0203, adequate placement score, or by meeting determined placement measures

3 Credits After analyzing events in American history from 1400 to 1877 in such areas as revolution, geographic and social mobility, political reform, government precedents and war, students will be able to identify patterns of present day mobility, describe governmental operations in their society and help resolve conflict in society based on the student's search for change, precedents, and conflict in the American past. A general education requirement.

HIST 1493 - U.S. History Since The Civil War

Prerequisites: ENGL 0203, adequate placement score, or by meeting determined placement measures

3 Credits After analyzing events in American history from 1870 to the present in such areas as political reform, industrialization, urbanization, ethnic acculturation and war, the student will be able to identify meaningful changes in his society, identify equal rights in that society, and help resolve conflict in this society based on the students search for change, equal rights and conflicts in the American past.

MATH 1513 - College Algebra for Business, Life Sciences and Social Sciences

Prerequisites: MATH 0403 or adequate math placement test score; ENGL 0203, adequate placement score, or by meeting determined placement measures

3 Credits The student will demonstrate an understanding of the general concepts of relation and function and specifically of polynomial, exponential, and logarithmic functions; the ability to solve systems of equations by utilizing matrices and determinants; and the ability to solve practical problems using algebra.

MATH 2013 - Introduction to Statistics

Prerequisites: MATH 0403 or adequate math placement test score; ENGL 0203, adequate placement score, or by meeting determined placement measures

3 Credits The student will solve problems applying the concepts of random sampling, elementary probability, testing hypotheses, descriptive measures, chi-square, regression and correlation, and analysis of variance.

POLSC 1113 - American Federal Government

Prerequisites: ENGL 0203, adequate placement score, or by meeting determined placement measures

3 Credits A study of the principles, structure, processes and functions of the United States federal government.

SCL 1001 - Success in College and Life

Prerequisites: ENGL 0106 or adequate reading/writing assessment scores

1 Credit Students will learn best practices for academic, career, and personal success. Students will discover their individual strengths, interests, and values to create a personalized plan; select and utilize resources that are applicable to their growth and success; and engage as active and responsible members of the academic community. This course should be taken during a student's first semester of college work at Oklahoma City Community College and is a required course in degree plans to satisfy the Life Skills requirement.