

BIOSCIENCE TECHNOLOGY

Rock Creek Campus
Science and Technology, Building 7/202
971-722-7257 or 971-722-7282

CAREER AND PROGRAM DESCRIPTION

Bioscience Technology refers to the research and development of products which use the processes, products or principles of living organisms to solve problems. The applications of bioscience range from developing and manufacturing better ways to diagnose and treat disease, to improving the production of plant crops, and even using microorganisms to clean up toxic wastes. The field is dynamic, employing applications and innovations that are cutting-edge and in many cases cut across traditional disciplines. Skilled technicians with broad-based laboratory training find employment in a variety of settings, working with scientists at all levels in research, development, manufacturing, testing, and quality control and assurance. Technicians are needed in both large and small companies, research institutions, at local and state agencies, in private service laboratories and in some related industries.

Course work in the Bioscience program involves four distinct elements. Basic science courses provide the background information so that technical elements can be more completely understood. The foundation course work provides a broad base of technical knowledge that prepares individuals for entry-level positions in a variety of Bioscience companies, and includes emphasis on working in a regulated environment, as well as developing skill in technical communication and job readiness. The core of these foundation courses make up the Biotechnician Certificate. The advanced technical courses develop more specific skill sets, and provide for development of the fundamental skills in this more advanced context. Students may choose some electives from outside of the BIT program, in order to increase the breadth of training or focus on a specific sector of the bioscience industry. Once the formal course work has been completed, the work experience component will ensure that students have a chance to put their skills and knowledge into a working context.

DEGREES AND CERTIFICATES OFFERED

Associate of Applied Science Degree

Bioscience Technology

Less than One-Year: Career Pathway Certificate

Biotechnician

PREREQUISITES AND REQUIREMENTS

AAS Bioscience Technology:

Placement into WR 121 and MTH 95³

Biotechnician Certificate:

Placement into WR115, RD 115 and MTH 65

The Bioscience Technology program is a restricted entry program with limited enrollment. Contact the department for instructions.

BIOSCIENCE TECHNOLOGY AAS DEGREE

Minimum 90 credits. Students must also meet Associate Degree Comprehensive Requirements and Associate of Applied Science Requirements. Students must complete a total of sixteen credits of General Education. Some courses specified within the program may be used as General Education. Students should consult with program advisors for course planning.

Bioscience Technology Degree Credit Summary

BIT	26
Bioscience Degree Electives	30
Basic Science Electives	9
Remaining General Education	8
BI	5
CH	5
WR	4
CAS	3
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	Credit Total 90

Bioscience Technology Courses

BI	112	Cell Biology for Health Occupations ^{1*}	5
BIT	101	Introduction to Bioscience Technology	4
BIT	105	Bioscience Workplace Safety ⁴	2
BIT	107	Bioscience Lab Math ⁴	2
BIT	109	Basic Lab Techniques and Instruments ⁴	5
BIT	125	Quality Systems in Bioscience Technology	2
BIT	181	Exploring Bioscience	2
CAS	170	Beginning Excel	3
CH	104	Allied Health Chemistry I ^{2*}	5
WR	121	English Composition	4
BIT	280A	Work Experience ^{**}	8
BIT	280B	Work Experience Seminar ^{**}	1
Bioscience Degree Electives			30
Basic Science Electives			9
Remaining General Education			8

^{*}Could be used as General Education

^{**}The Work Experience component is taken after all other coursework has been completed.

¹BI 211 may substitute for BI 112.

²CH 221 may substitute for CH 104.

³MTH 95 is not required for the degree, but a Math 95 competency is an exit requirement. Placement into MTH 111 satisfies the MTH 95 competency. It is recommended that students take MTH 111 because it is useful for other Science and Physics courses.

⁴BIT 110 (or BIT 110A and BIT 110B), can be substituted for BIT 105, 107 and 109

Basic Science Electives

BI	211	Principles of Biology [*]	5
BI	212	Principles of Biology [*]	5
BI	213	Principles of Biology [*]	5
BI	234	Microbiology [*]	5
CH	211	Introduction to Biochemistry [*]	4
CH	221	General Chemistry I [*]	5
CH	222	General Chemistry II [*]	5
CH	223	General Chemistry III [*]	5
MTH	243	Statistics I [*]	4
PHY	201	General Physics [*]	4
PHY	202	General Physics [*]	4
PHY	203	General Physics [*]	4

Note: Students who are interested in transferring to PSU for a BS degree in Biology will need to complete BI 211, 212, 213 and CH 221, 222 and 223 in order to be eligible for junior status.

Bioscience Technology Degree Electives- (20 must be BIT)

BIT	201	Immunochemical Methods	5
BIT	203	Recombinant DNA	5
BIT	205	Bioseparations	5
BIT	207	Cell Culture	5
BIT	215	Protein Purification	5
BIT	223	Advanced DNA Techniques	5

MT	111	Elec circuits and Devices I	4
MT	112	Elec circuits and Devices II	4
MT	113	Elec circuits and Devices III	4
MT	121	Digital Systems I	3
MT	122	Digital Systems II	3
MT	222	Quality Control Methods in Manufacturing	3

BIOTECHNICIAN: CAREER PATHWAY CERTIFICATE

Minimum 13 credits. Students must also meet certificate requirements. The Biotechnician certificate is a Career Pathway. All courses are contained in the Bioscience Technology AAS Degree.

BIT	110	Bioscience Technology Basics ⁵	9
		or	
BIT	110A	Bioscience Technology Basics Part I	(4.5)
		and	
BIT	110B	Bioscience Technology Basics Part II	(4.5)
BIT	125	Quality Systems in Bioscience	2
BIT	181	Exploring Bioscience	2

⁵May substitute BIT 105, 107 and 109 for BIT 110

COURSE DESCRIPTIONS

BIT 101 Introduction to Bioscience Technology 4.00 Introduction to and survey of the broad range of activities in bioscience technology. Major applications and advances in pharmaceuticals, medical devices, genomics, forensics, proteomics, agriculture, and environmental science will be covered. Includes examination and discussion of ethical, legal and hands-on activities based on authentic bioscience applications. Recommend: BI 112 or 211. Prerequisites: Placement into WR 115 and RD 115.

BIT 105 Safety in the Bioscience Workplace 2.00 Survey of technical and regulatory aspects of physical, chemical, radiation and biological safety in the bioscience laboratory. Topics covered include: mechanical and electrical systems, hazards due to temperature and pressure, handling and storing hazardous chemicals, personal protective equipment, chemical waste disposals and spill, ionizing radiation and control measures, biological containment, disinfection/sterilization, medical waste handling, applicable regulations and guidelines. Prerequisites: Placement into WR 115 and RD 115. Audit available.

BIT 107 Bioscience Lab Math 2.00 Develops mathematics skill and problem-solving related to work in a bioscience laboratory or biomanufacturing environment. Includes calculations for solution preparation, analysis and manipulation of molecules and cells, analysis and interpretation of data and commonly used statistical methods. Recommend: Prior or concurrent college-level course in Chemistry, or BI 112 or 211, and MTH 65. Audit available.

BIT 109 Basic Laboratory Techniques and Instruments 5.00 Introduces fundamental principles and practices for the bioscience laboratory. Principles of quality documentation, safety, and precise communication will be emphasized throughout, in the context of technical activities that include solution preparation, instrumentation for measurements (weight, volume, temperature, pH, conductivity and spectroscopy), assay techniques and routine laboratory maintenance. Recommend prior or concurrent college level course in Chemistry, or BI 112 or 211, and MTH 65. Prerequisite: Placement into WR 115 and RD 115. Prerequisite or concurrent enrollment in: BIT 105 and BIT 107.

BIT 110 Bioscience Technology Basics 9.00 Introduces fundamental principles and practices for the bioscience laboratory and biomanufacturing environment. Principles of quality documentation, safety, and communication will be emphasized throughout, in the context of technical activities that include solution preparation, instrumentation for measurements (weight, volume, temperature, pH, conductivity and spectroscopy) and selected biomanufacturing activities. Program Admission required.

BIT 110A Bioscience Technology Basics Part 1 4.50 Introduces fundamental principles and practices for the bioscience laboratory and biomanufacturing environment. Principles of quality documentation, safety, and communication will be emphasized throughout, in the context of technical activities that include measurements (weight, volume temperature, pH conductivity and spectroscopy) and solution preparation. Program Admission Required.

BIT 110B Bioscience Technology Basics Part 2 4.50 Introduces fundamental principles and practices for the bioscience laboratory and biomanufacturing environment. Principles of quality documentation, safety, and communication will be emphasized. Technical activities focus on laboratory and manufacturing instrumentation, aseptic principles and practices and the structure, function and measurement of biological molecules. Prerequisite: BIT 110A.

BIT 125 Quality Systems in Bioscience Technology 2.00 Introduction to internal and external quality systems that apply to the bioscience industry, with emphasis on working in a regulated environment. Also covers various agencies that regulate the bioscience industry, FDA regulation for good laboratory and manufacturing practices (GLP and cGMP), and processes relating to product approval. Audit available.

BIT 165 Biotechniques: Recombinant DNA 4.00 This course will give students authentic hands-on experience in recombinant DNA work. Students will learn the basic principles, strategies and techniques that are the essential tools for molecular biology. These include the preparation of plasmid vector and insert DNA, transformation, plasmid purification, and analysis of constructs from restriction patterns. Southern blot hybridization and PCR. Recommended: BI 101 or 211 and CH 100, 104 or 221.

BIT 175 Biotechniques: Proteins 4.00 Covers theory and practice in the purification and analysis of proteins. Techniques commonly used in research labs and biotechnology settings will be covered, including protein assay, SDS-PAGE, enzyme assay, chromatography and protein purification principles and practices. Recommended BI 101 or 211 and CH 100, 104 or 221, and MTH 95

BIT 181 Exploring Bioscience 2.00 Overview and exploration of bioscience technology, from research and development to manufacturing. Covers career options and pathways, and guides students in the development of skills to identify potential internships, entry-level positions and education and training opportunities that fit the student's goals and trends in the field. Participation in field trips is essential. Prerequisite: Concurrent enrollment in BIT 110 or instructor permission.

BIT 201 Immunochemical Methods 5.00 Introduces the general properties and uses of antibody molecules. Includes an overview immune response, biosynthesis of immunoglobulin, obtaining, purifying and labeling antibodies, and using antibodies in a variety of common applications (ELISA, Western blot, immunoprecipitation and immunocytochemistry, antibody-based affinity chromatography). Prerequisite: BIT 109 or 110; BI 112 or CH 100 or higher; or instructor permission.

BIT 203 Recombinant DNA 5.00 Laboratory-intensive course focusing on the strategies and techniques used in recombinant DNA work. Covers vector and insert options and preparation, quantitation of DNA, ligation and transformation procedures, and analysis by restriction digest, blot hybridization and PCR. Prerequisites: BIT 109 or BIT 110; and any of the following: BIT 101, BI 102, BI 112, BI 212 or BI 234, or instructor permission.

BIT 205 Bioseparations 5.00 Introduction of commonly used methods for separation of biological molecules for both analytical and preparative applications. This laboratory-intensive course will cover the principles of and practice in filtration, differential precipitation, and electrophoretic and chromatographic techniques. Prerequisite: BIT 109 or BIT 110; and any of the following: BIT 155, BI 112, CH 100 or higher; or instructor permission.

BIT 207 Cell Culture 5.00 Laboratory-intensive course providing introduction to and practice in the culture of animal cells and cell lines. Focus is on routine maintenance and record-keeping, including media preparation, cryopreservation, and troubleshooting common culture problems. Prerequisite: BIT 109 or BIT 110 or instructor permission.

BIT 211 Biomolecular Principles 4.00 Structure/function relationships of biological molecules. Principles of organic and biochemistry will be related to practical problems of function, detection and separation of biological molecules. Prerequisite: (CH 106 or 223); and BIT 109.

BIT 215 Protein Purification 5.00 Application of commonly used methods for separation of biological molecules in multi-step protein purifications. This laboratory intensive course will focus on issues of recovery and yield, step-to-step analysis and troubleshooting, as well as documentation and reporting procedures and results. Prerequisite: BIT 205 or instructor permission.

BIT 217 Tissue Culture II 4.00 Second term of a two-term laboratory-intensive course offering more advanced training and practical experience in culture of plant and animal cells. Prerequisite: BIT 207.

BIT 221 Techniques in Molecular Biology I 5.00 First term of a two-term laboratory-intensive course focusing on theory and practice of techniques for analysis and manipulation of nucleic acids. Emphasizes recombinant DNA techniques and strategies and analysis of recombinant DNA by restriction digest, blot hybridization and PCR. Prerequisite: (BI 234 or equivalent), and BIT 109.

BIT 223 Advanced DNA Techniques 5.00 Laboratory-intensive course focusing on the theory and practice of techniques for analysis and manipulation of nucleic acids. Topics include construction and use of plasmid and phage libraries, DNA sequence determination and analysis, bioinformatics, and applications of PCR. Prerequisites: BIT 203 or instructor permission.

BIT 280A Work Experience Students work in a biotechnology laboratory, supervised by professionals on site and by program instructor(s). Department permission required.

BIT 280B Work Experience - Seminar 1.00 PREREQ: Department permission required.