



**Bioprocess Technology Credential:
Associate in Applied Science Degree in
BioQuality Technology A50440QA**

The Bioprocess Technology curriculum is designed to prepare individuals to work in Quality Assurance in biological products manufacturing facilities. Students will combine basic science and communication skills, manufacturing technologies, current good manufacturing practices (cGMP), quality systems, auditing, and validation in the course of study.

Students will be expected to develop a strong basic science foundation with a sound understanding of the major technologies employed in the industry. They will also be expected to develop collaborative and disciplined work ethics while consistently practicing problem-solving skills.

Upon successful completion of the program, individuals should possess the necessary skills to qualify for employment in a variety of bioprocessing industries.

Program Length: 5 semesters
Career Pathway Options: Associate in Applied Science Degree in BioQuality Technology
Program Sites: Lee Campus - Day Program

Course requirements for BioQuality Technology Degree

A. General Education Courses (19 SHC)		C-L-SHC
COM 120	Interpersonal Communication	3-0-3
	OR	
COM 231	Public Speaking	3-0-3
ENG 111	Expository Writing	3-0-3
ENG 111A	Expository Writing Lab	0-2-1
ENG 114	Professional Research and Reporting	3-0-3
	Humanities/Fine Arts Elective	3
MAT 121	Algebra and Trigonometry	2-2-3
	OR	
MAT 161	College Algebra	3-0-3
	Social/Behavioral Science Elective	3
B. Required Major Core Courses (21 SHC)		
BPM 110	Bioprocess Practices	3-4-5
BPM 111	Bioprocess Measurements	3-3-4
BPM 112	Upstream Bioprocessing	3-4-5
BPM 113	Downstream Bioprocessing	3-3-4
PTC 110	Industrial Environment	3-0-3
C. Other Major Hours Required for Graduation (28 SHC)		
BIO 110	Principles of Biology	3-3-4
BIO 175	General Microbiology	2-2-3
CHM 131	Introduction to Chemistry	3-0-3
CHM 131A	Introduction to Chemistry Lab	0-3-1
CHM 132	Organic and Biochemistry	3-3-4
CIS 110	Introduction to Computers	2-2-3
COE 112	Co-op Work Experience I	0-20-2
ISC 175	Quality Assurance Fundamentals	1-0-1

ISC 278	cGMP Quality Systems	2-0-2
ISC 279	Auditing for cGMP	2-2-3
ISC 280	Validation Fundamentals	1-2-2

Total Semester Hours Credit required for graduation: 68

Semester Curriculum for BioQuality Technology Degree

1st Semester (Fall)		C-L-SHC
BIO 110	Principles of Biology	3-3-4
CHM 131	Introduction to Chemistry	3-0-3
CHM 131A	Introduction to Chemistry Lab	0-3-1
CIS 110	Introduction to Computers	2-2-3
MAT 161	College Algebra	3-0-3
	OR	
MAT 121	Algebra and Trigonometry	2-2-3
PTC 110	Industrial Environment	3-0-3
		13/14-8/10-17
2nd Semester (Spring)		
BIO 175	General Microbiology	2-2-3
BPM 110	Bioprocess Practices	3-4-5
CHM 132	Organic/Biochemistry	3-3-4
ENG 111	Expository Writing	3-0-3
ENG 111A	Expository Writing Lab	0-2-1
ISC 175	Quality Assurance Fundamentals	1-0-1
		12-11-17
3rd Semester (Summer)		
COE 112	Co-op Work Experience I	0-20-2
4th Semester (Fall)		
BPM 111	Bioprocess Measurements	3-3-4
COM 231	Public Speaking	3-0-3
	OR	
COM 120	Interpersonal Communication	3-0-3
	Humanities/Fine Arts Elective	3-0-3
ISC 278	cGMP Quality Systems	2-0-2
ISC 279	Auditing for cGMP	2-2-3
		13-5-15
5th Semester (Spring)		
BPM 112	Upstream Bioprocessing	3-4-5
BPM 113	Downstream Bioprocessing	3-3-4
ENG 114	Professional Research and Reporting	3-0-3
ISC 280	Validation Fundamentals	1-2-2
	Social/Behavioral Science Elective	3
		13-9-17
Total Semester Hours Credit: 68		

COURSE DESCRIPTIONS

BIO 110 Principles of Biology 3-3-4
This course provides a survey of fundamental biological principles for non-science majors. Emphasis is placed on basic chemistry, cell biology, metabolism, genetics, taxonomy, evolution, ecology, diversity, and other related topics. Upon completion, students should be able to demonstrate increased knowledge and better understanding of biology as it applies to everyday life. *This course has been approved to satisfy the Comprehensive Articulation Agreement general education core requirement in natural sciences/mathematics.*

BIO 175 General Microbiology 2-2-3
Prerequisites: BIO 110, BIO 163, BIO 166 or BIO 169
This course covers principles of microbiology with emphasis on microorganisms and human disease. Topics include an overview of microbiology and aspects of medical microbiology, identification and control of pathogens, disease transmission, host resistance, and

immunity. Upon completion students should be able to demonstrate knowledge of microorganisms and the disease process as well as aseptic and sterile techniques. *This course has been approved to satisfy the comprehensive articulation agreement pre-major and/or elective course requirement.*

BPM 110 Bioprocess Practice 3-4-5

This course provides a study of plant operations including various plant utility systems and detailed study of the varied plant environments in a bioprocessing facility. Emphasis is placed on quality mindset and principles of validation through applications of monitoring procedures. Upon completion, students should be able to appreciate the rigors of industry regulation and its necessity.

BPM 111 Bioprocess Measurement 3-4-5

Prerequisite: BIO 110, BPM 110

This course covers a variety of physical measurements. Emphasis is placed on pH, temperature, pressure and flow rates, as well as spectrophotometry, and biochemical and chemical analytical methods. Upon completion, students should be able to demonstrate and perform many aspects of process monitoring.

BPM 112 Upstream Measurements 3-3-4

Prerequisites: BPM 111

This course introduces techniques involved in cell growth and fractionation. Topics include fermentation theory and applications as well as cell harvesting, cell disruption, and fractionation methods. Upon completion, students should be able to grow cells as well as isolate and collect various fractions.

BPM 113 Downstream Bioprocessing 3-3-4

Prerequisites: BPM 111, CHM 131, CHM 131A

This course introduces a variety of techniques involved in separation procedures. Topics include extraction and precipitation, concentration and molecular filtration methods as well as different types of chromatography. Upon completion, students should be able to perform most separation procedures with an understanding of industrial scale procedures.

CHM 131 Intro to Chemistry 3-0-3

Co-requisites: CHM 131A

This course introduces the fundamental concepts of inorganic chemistry. Topics include measurement, matter and energy, atomic and molecular structure, nuclear chemistry, stoichiometry, chemical formulas and reactions, chemical bonding, gas laws, solutions, and acids and bases. Upon completion, students should be able to demonstrate a basic understanding of chemistry as it applies to other fields. *This course has been approved to satisfy the Comprehensive Articulation Agreement general education core requirement in natural sciences/mathematics.*

CHM 131A Intro to Chemistry Lab 0-3-1

C-requisites: CHM 131

This course is a laboratory to accompany CHM 131. Emphasis is placed on laboratory experiences that enhance materials presented in CHM 131. Upon completion, students should be able to utilize basic laboratory procedures and apply them to chemical principles presented in CHM 131. Also included are EMR, spectrophotometry, extraction, safety and feed analysis. *This course has been approved to satisfy the Comprehensive Articulation Agreement general education core requirement in natural sciences/mathematics.*

CHM 132 Organic and Biochemistry 3-3-4

Prerequisites: CHM 131

This course provides a survey of major functional classes of compounds in organic and biochemistry. Topics include structure, properties, and reactions of the major organic and biological molecules and basic principles of metabolism. Upon completion, students should be able to demonstrate an understanding of fundamental chemical concepts needed to pursue studies in related professional fields. Additional topics are spectrophotometer, extraction, MSDS and a project. *This course has been approved to satisfy the Comprehensive Articulation Agreement general education core requirement in natural sciences/mathematics.*

CIS 110 Intro to Computers 2-2-3

This course provides an introduction to computers and computing. Topics include the impact of computers on society, ethical issues, and hardware/software applications, including spreadsheets, databases, word processors, graphics, the Internet, and operating systems. Upon completion, students should be able to demonstrate an understanding of the role and function of computers and use the computer to solve problems. This course has been approved to satisfy the Comprehensive Articulation Agreement general education core requirement in natural sciences/mathematics.

COE 112 Co-op Work Experience I 0-20-2

This course provides work experience with a college approved employer in an area related to the student's program of study. Emphasis is placed on integrating classroom learning with related work experience. Upon completion, students should be able to evaluate career selection, demonstrate employability skills, and satisfactorily perform work-related competencies.

COM 120 Interpersonal Communication 3-0-3

This course introduces the practices and principles of interpersonal communication in both dyadic and group settings. Emphasis is placed on the communication process, perception, listening, self-disclosure, speech apprehension, ethics, nonverbal communication, conflict, power, and dysfunctional communication relationships. Upon completion, students should be able to demonstrate interpersonal communication skills, apply basic principles of group discussion, and manage conflict in interpersonal communication situations. *This course has been approved to satisfy the comprehensive articulation agreement general education core requirement in humanities/fine arts.*

COM 231 Public Speaking 3-0-3

This course provides instruction and experience in preparation and delivery of speeches within a public setting and group discussion. Emphasis is placed on research, preparation, delivery, and evaluation of informative, persuasive, and special occasion public speaking. Upon completion, students should be able to prepare and deliver well-organized speeches and participate in group discussion with appropriate audiovisual support. *This course has been approved to satisfy the Comprehensive Articulation Agreement general education core requirement in humanities/fine arts.*

ENG 111 Expository Writing 3-0-3

Prerequisites: 80 CPT reading score and 86 CPT writing score, or 18 ACT score, or 450 verbal SAT score, or satisfactory completion of developmental requirements.

Co-requisites: ENG 111A

This course is the required first course in a series of two designed to develop the ability to produce clear expository prose. Emphasis is placed on the writing process including audience analysis, topic selection, thesis support and development, editing, and revision. Upon completion, students should be able to produce unified,

coherent, well-developed essays using standard written English. *This course has been approved to satisfy the Comprehensive Articulation Agreement general education core requirement in English composition.*

ENG 111A Expository Writing Lab 0-2-1

Prerequisites: 80 CPT reading and 86 CPT writing score, or 18 ACT score, or 450 verbal SAT score, or satisfactory completion of developmental requirements.

Co-requisites: ENG 111

This writing laboratory is designed to apply the skills introduced in ENG 111. Emphasis is placed on the editing and revision components of the writing process. Upon completion, students should be able to apply those skills in the production of final drafts in ENG 111. *The computer is used as a writing and design tool for this course.*

ENG 114 Prof. Research & Reporting 3-0-3

Prerequisites: ENG 111

This course, the second in a series of two, is designed to teach professional communication skills. Emphasis is placed on research, listening, critical reading and thinking, analysis, interpretation, and design used in oral and written presentations. Upon completion, students should be able to work individually and collaboratively to produce well-designed business and professional written and oral presentations. The computer is used as a writing and design tool for this course. *This course has been approved to satisfy the Comprehensive Articulation Agreement general education core requirement in English composition*

ISC 175 QA Fundamentals 1-0-1

This course is designed to increase fundamental knowledge in the philosophies, principles, and practice of quality in the work environment. Topics include the history and basics of quality, philosophies of quality, daily application of principles, and roles of quality professionals with emphasis on cGMP environment. Upon completion, students should be able to discuss quality fundamentals, components of quality systems, and identify standards and programs of quality.

ISC 278 cGMP Quality Systems 2-0-2

This course focuses on the development, implementation, and ongoing maintenance of a quality system in a cGMP environment. Topics include the cGMP standard, components of cGMP quality systems, quality function roles and training, development of documentation such as SOPs, and system review procedures. Upon completion, the student should be able to identify the components of a quality system and develop a quality system manual utilizing the cGMP standard.

ISC 279 Auditing for cGMP 2-2-3

*Prerequisites: COE*112*

This course provides basic knowledge in internal audit planning, implementation, and reporting utilizing cGMP as the standard. Topics include auditing basics and types, phases of the audit process, regulatory requirements, auditing tools, auditor qualifications and skills, and behaviors while being audited. Upon completion, students should be able to identify the components of an audit program, develop a plan based on cGMP standards, and demonstrate reporting techniques.

ISC 280 Validation Fundamentals 1-2-2

This course covers the fundamental concepts and components of a validation program in a cGMP environment. Emphasis is placed on FDA requirements concerning validation, types of validation, documentation, procedures, and the QA role. Upon completion, students should be able to discuss the purpose of validation, identify the steps in the validation process, and effectively utilize sample documentation.

MAT 121 Algebra/Trigonometry I 2-2-3

Prerequisites: CPT arithmetic score of 57 and algebra score of 38, or ACT score of 18, or SAT mathematics score of 450, or successful completion of developmental requirements

This course provides an integrated approach to technology and the skills required to manipulate, display, and interpret mathematical functions and formulas used in problem solving. Topics include simplification, evaluation, and solving of algebraic and radical functions; complex numbers; right triangle trigonometry; systems of equations; and the use of technology. Upon completion, students should be able to demonstrate an understanding of the use of mathematics and technology to solve problems and analyze and communicate results.

MAT 161 College Algebra 3-0-3

Prerequisites: CPT arithmetic score of 57 and algebra score of 70, or ACT score of 18, or SAT mathematics score of 450, or successful completion of developmental requirements

This course provides an integrated technological approach to algebraic topics used in problem solving. Emphasis is placed on applications involving equations and inequalities; polynomial, rational, exponential and logarithmic functions; and graphing and data analysis/modeling. Upon completion, students should be able to choose an appropriate model to fit a data set and use the model for analysis and prediction. *This course has been approved to satisfy the Comprehensive Articulation Agreement general education core requirement in natural sciences/mathematics for the Associate in Arts Degree.*

PTC 110 Industrial Environment 3-0-3

This course introduces the pharmaceutical industry, including a broad overview of work in this field. Emphasis is placed on good manufacturing practices (GMP), work conduct, company organization, job expectations, personal safety, hygiene, and company rules and regulations. Upon completion, students should be able to follow good manufacturing practice regulations and inspect a pharmaceutical manufacturing facility for compliance with GMP.