

ARTICULATION AGREEMENT
between
INDIANA UNIVERSITY-PURDUE UNIVERSITY INDIANAPOLIS
and
IVY TECH STATE COLLEGE- INDIANAPOLIS
FOR THE TRANSFER OF THE
ASSOCIATE OF SCIENCE (A.S.) DEGREE IN BIOTECHNOLOGY
into the
BACHELOR OF SCIENCE (B.S.) DEGREE IN BIOLOGY

The purpose of the Articulation Agreement is to provide a provisional framework for students at Ivy Tech State College-Indianapolis to continue their education toward the baccalaureate degree at Indiana University-Purdue University Indianapolis in the field of Biology.

To ensure the smooth transition from the associate degree in biotechnology to the biology baccalaureate program at IUPUI, the faculty of both institutions have agreed that students who complete the curriculum for the A.S. in Biotechnology will be admitted into the B.S. in Biology program, with the expectation of completing the B.S. in five semesters.

In order to benefit from this program agreement, Ivy Tech students must complete their A.S. degree in Biotechnology with a sufficient grade-point average to be accepted into the IUPUI Biology program. In addition, only courses with a grade of C or above will be credited toward the baccalaureate degree.

To ensure consistency and accuracy, the curriculum will be periodically reviewed by representatives from both institutions in order to communicate and update information regarding curriculum and textbooks.

This agreement is effective Fall 2004. All course work taken prior to Fall 2004 will be evaluated by IUPUI program faculty on a course-by-course basis in order to determine its transferability. This Articulation Agreement, including any modifications, may be reviewed by either institution upon request. Further, it is expected that both institutions will keep the other party aware of all curriculum changes as they occur.

While both parties to the agreement understand its purpose is to maximize transfer opportunities for students, they also recognize that limits may be placed on courses accepted under the provisions of this agreement should the student subsequently decide to change to another program not covered by the agreement.

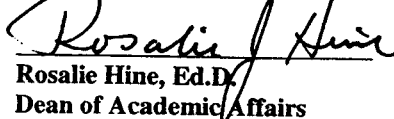
For Ivy Tech State College-Indianapolis


Todd Murphy, M.S.

Chair, Biotechnology


Kathleen Lee, Ed.D.

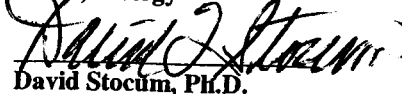
Director, Division of Health and Public Services


Rosalie Hine, Ed.D.
Dean of Academic Affairs

For IUPUI


N. Douglas Lees, Ph.D.

Chair, Biology


David Stocum, Ph.D.

Dean, Purdue School of Science, IUPUI


William Plater, Ph.D.

Executive Vice Chancellor and
Dean of the Faculties

Ivy Tech State College
Curriculum for Biotechnology
ASSOCIATE OF SCIENCE

GENERAL EDUCATION CORE – 39 CREDITS

HEW	101	English Composition	3
HEW	108	Technical Writing	3
*XXX	XXX	Humanities/Social Science Elective	3
MAT	131	Algebra and Trigonometry I	3
MAT	132	Algebra and Trigonometry II	3
MAT	115	Statistics	3
***	***	General Chemistry I	5
***	***	General Chemistry II	5
SIC	***	Organic Chemistry (lecture only)	3
***	***	General College Biology I	4
SIP	101	Physics	4

SPECIALTY CORE – 29 CREDITS

BTN	XXX	Introduction to Biotechnology	4
BTN	XXX	Safety and Regulatory Compliance	3
BTN	XXX	Cell Culture and Cellular Processes	4
BTN	XXX	Analytical Methods for Biotechnology I	3
BTN	XXX	Analytical Methods for Biotechnology II	3
BTN	XXX	Manufacturing Processes	4
BTN	XXX	Biotechnology Elective	4
BTN	280	Internship	4

Electives

BTN	XXX	Molecular Biology and Genetic Engineering	4
BTN	XXX	Fermentation	4
BTN	XXX	Protein Analysis and Purification	4

TOTAL CREDITS **68**

BTN ### **Safety and Regulatory Compliance for Biotechnology**

Credit/Contact: 3 hours/ 3 contact hours lecture

Prerequisites: English Composition I

Overview of laboratory safety procedures and precautions, biosafety, radiation safety, compliance standards of regulatory agencies. Emphasis will be placed on understanding the regulatory environment of pharmaceutical, diagnostic and agricultural research and manufacturing. Students will be introduced to the concepts of current good laboratory practices (cGLP), current good manufacturing practices (cGMP), standard operating procedures (SOP) and validation as they apply to industries involved in biotechnology.

BTN ### **Introduction to Biotechnology**

Credit/Contact: 4 hours/ 3 contact hours lecture - 2 contact hours laboratory

Prerequisites: General Biology I

This course provides a general introduction to the field of biotechnology. Research trends and methodologies currently exploited within the field are discussed along with the impact these endeavors may have on the quality of life. This course will survey the history, current and projected state of biotechnology as it relates to life science research, medicine, and agriculture. Laboratory will allow students to work with selected techniques in this field.

BTN ### **Cell Culture and Cellular Processes**

Credit/Contact: 4 hours/ 2 contact hours lecture - 4 contact hours laboratory

Prerequisites: General Chemistry II and Biotechnology I

The student will be introduced to major biochemical pathways, cellular structure and function at a molecular level. Topics to be considered include the structure and function of the cell membrane, cytoskeleton and various organelles. Cellular respiration will be discussed. Protein synthesis, processing and export will be examined. Those processes involved in cell division will also be investigated and related to cancer. The laboratory will center upon techniques involving animal, plant, fungi and bacterial cell cultures. Students will be taught how to isolate, culture and preserve prokaryotic organisms. Students will be taught how to maintain and preserve eukaryotic cell cultures. Students will learn to procure cell cultures from ATCC and other repositories.

BTN ### **Analytic Methods in Biotechnology I**

Credit/Contact: 3 hours/ 2 contact hours lecture - 4 contact hours laboratory

Prerequisites: General Chemistry II

Students will become familiar with the theory and application of many analytical methods currently utilized in the field of biotechnology. These methods will include: ELISA and immunoaffinity techniques; methods for determining enzymatic activity; spectrophotometric methods; chromatographic methods; electrophoresis; light and electron microscopy. When feasible, techniques will be practiced in the laboratory setting. Methods utilizing radioactive isotopes will be discussed. Considerable emphasis will be placed on proper methods for data recording, analysis and presentation.

BTN ### **Analytic Methods in Biotechnology II**

Credit/Contact: 3 hours/ 2 contact hours lecture - 4 contact hours laboratory

Prerequisites: General Chemistry II

Students will continue their study of the theory and application of many analytical methods currently utilized in the field of biotechnology. These methods will include: ELISA and immunoaffinity techniques; methods for determining enzymatic activity; spectrophotometric methods; chromatographic methods; electrophoresis; light and electron microscopy. When feasible, techniques will be practiced in the laboratory setting. Methods utilizing radioactive isotopes will be discussed. Considerable emphasis will be placed on proper methods for data recording, analysis and presentation.

BTN ### **Biotechnology Manufacturing Processes**

Credit/Contact: 4 hours/ 3 contact hours lecture - 2 contact hours laboratory

Prerequisites: Organic Chemistry I

Student will be instructed in assembly, troubleshooting and standard operating procedures of manufacturing equipment associated with biotechnology including: pumps, valves, piping, tanks, mixing, material flow, pressure vessels, cryo-technology, freeze-drying, fill/label equipment, filter, homogenizers, automated inspections, etc. Students will be introduced to the regulatory environment facing most biotechnology endeavors including those mandated by FDA, USDA, OSHA, etc.

BTN ### **Genetic Engineering and DNA Analysis**

Credit/Contact: 4 hours/ 2 contact hours lecture – 4 contact hours laboratory

Prerequisites: Cell Culture and Cellular Processes and Analytic Methods in Biotechnology II (may be taken concurrently)

Students will become familiar with the theory and practice of common molecular biology techniques. Methods for manipulation of DNA and RNA that will be explored include nucleic acid extraction and electrophoresis, plasmid and phage construction, construction and screening of cDNA libraries and applications of PCR. Utilization of internet-based genomic and proteomic databases will be emphasized.

BTN ### **Fermentation**

Credit/Contact: 4 hours/ 2 contact hours lecture – 4 contact hours laboratory

Prerequisites: Cell Culture and Cellular Processes and Analytic Methods in Biotechnology II (may be taken concurrently)

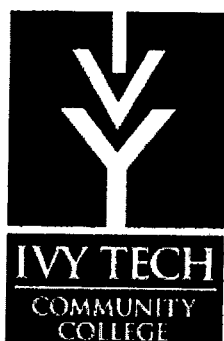
Students will be introduced to fermentation processes used for commercial purposes and the operation of small- and large-scale fermentors. Methods used to harvest product from fermentors and the regulatory requirements associated with commercial fermentation will also be explored.

BTN ### **Protein Analysis and Purification**

Credit/Contact: 4 hours/ 2 contact hours lecture - 4 contact hours laboratory

Prerequisites: Cell Culture and Cellular Processes and Analytic Methods in Biotechnology II (may be taken concurrently)

Students will be taught the theoretical basis of many commonly used protein purification methods (column chromatography, HPLC, affinity chromatography, immunoprecipitation, ultracentrifugation, etc.). Students will be taught to determine which method is most applicable in various situations and why that method should be utilized. When possible, students will be given an opportunity to perform these techniques in the laboratory.



Student Name <hr/>

Health Sciences
Biotechnology
Associate of Science
Ivy Tech Community College – Central Indiana
Academic Year 2005-2006

The Biotechnology program prepares students to work in fields related to biotechnology and the life sciences and to pursue baccalaureate degrees in related or general fields. Graduates may expect employment as technicians in various areas of biotechnology with employment possibilities in pharmaceuticals, animal and agricultural science, surgical and medical instruments, biomedical supply and safety equipment, biomedical plastics and environmental management.

General Education/Tech Core - 39 Credits

		Credits	Grade	Prerequisites
BIO 121	General Biology	4		ENG 025, ENG 032, MAT 050
CHM 105	General Chemistry I	5		ENG 025, ENG 032, MAT 111 Coreqs: MAT 132 or MAT 133 or MAT 136
CHM 106	General Chemistry II	5		CHM 105, MAT 132 or MAT 133 or MAT 136
CHM 204	Lectures in Organic Chemistry	3		CHM 106
ENG 111	English Composition	3		ENG 025, ENG 032
ENG 211	Technical Writing	3		ENG 111
MAT 115	Statistics	3		MAT 111
MAT 136	College Algebra	3		MAT 111
MAT 137	Trigonometry with Analytic Geometry	3		MAT 111
PHY 101	Physics I	4		MAT 121 or 131 or 134 or 137
Xxx xxx	Humanities/Social Sciences Elective	3		ENG 025, ENG 032, MAT varies based on course

Professional Core - 27 Credits

		Credits	Grade	Prerequisites
BTN 101	Introduction to Biotechnology	4		BIO 121
BTN 103	Safety & Regulatory Compliance for Biotechnology	3		BIO 105 or BIO 121 or CHM 101 or CHM 105 or CHM 111
BTN 201	Cell Culture and Cellular Processes	4		BTN 101, CHM 105 or CHM 111
BTN 211	Analytical Methods for Biotechnology I	3		BTN 101, CHM 105 or CHM 111
BTN 212	Analytical Methods for Biotechnology II	3		BTN 211
BTN 280	Internship	3		BTN program advisor approval
BTN 227 or BTN 231 or BTN 233	Genetic Engineering and DNA Analysis or Industrial Processes and Fermentation or Protein Analysis and Purification	4 4 4		BTN 201 or BTN 211 BTN 201, BTN 211 BTN 201, BTN 211
BTN 217	Biotech Manufacturing Processes	3		CHM 204, BTN 211, BTN 201

Total Required Credits 66

Sample Full-time Curriculum Sequence Two Academic Years

Semester 5		Credits
Xxx xxx	Biotech Elective	4
BTN 217	Biotech Manufacturing Process	3
BTN 280	Internship	3
	Total Credits	10

Course Number and Name	Fall		Spring		Sum	
	D	E	D	E	D	E
BIO 121 General Biology	X	X	X	X	X	
CHM 105 General Chemistry I	X	X	X			
CHM 106 General Chemistry II			X	X	X	
CHM 204 Organic Chemistry	X					X
MAT 133 Cllg Algebra with Analytic Geomtry	X			X		
MAT 136 College Algebra	X			X		
BTN 101 Introduction to Biotechnology	X		X			X
BTN 103 Sfty & Reg Compliance for Biotech		X	X			
BTN 201 Cell Culture & Cellular Processes	X					
BTN 211 Analytical Methods for Biotech I	X			X		
BTN 212 Analytical Methods for Biotech II	X					X
BTN 217 Manufacturing Processes	X	X	X	X		
BTN 227 Genetic Engineering & DNA Analys	X			X		
BTN 231 Fermentation			X			
BTN 233 Protein Analysis & Purification			X			
BTN 280 Internship	X		X		X	

Use this chart to plan the length of time until you complete your program.

Semester 6		Credits
	Total Credits	