



University of Maryland University College

**Baccalaureate Degree Program in Biotechnology
Department of Social, Behavioral, Natural, and Mathematical
Sciences**

**PROGRAM ASSESSMENT PLAN
Program Outcomes and Learning Assessment Criteria**

Summer 2007

Baccalaureate Degree Program in Biotechnology

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Baccalaureate Degree Program in Biotechnology

PROGRAM OVERVIEW

The Bachelors of Professional and Technical Studies in Biotechnology is designed for students who have completed an associate's degree in biotechnology or a related field from a community college with which UMUC has an articulation agreement for this major. The biotechnology program builds on the technical and scientific knowledge gained in the associate's degree program and from direct experience in the field. The program of study includes required coursework in biological science, laboratory skills, seminar in the life sciences, and an internship in a biotechnology laboratory. The biotechnology degree prepares graduates for careers as research or production assistants in biomedical, industrial, agricultural, or environmental laboratories and/or for graduate study in bioinformatics, bioengineering, biotechnology, genetic engineering, genetics, microbiology, molecular biology, or protein engineering.

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PROGRAM OF STUDY

The program of study for the Baccalaureate Degree Program in Biotechnology is as follows:

GENERAL EDUCATION REQUIREMENTS

Communications	12 credit hours
Arts and Humanities	6 credit hours
Behavioral and Social Sciences	6 credit hours
Biological and Physical Sciences	7 credit hours
Mathematics	3 credit hours
Interdisciplinary or Emerging Issues	7 credit hours

CROSS-CURRICULAR PERSPECTIVE REQUIREMENTS

Historical Perspective	3 credit hours
International Perspective	3 credit hours
Civic Responsibility Perspective	3 credit hours

REQUIRED COURSES

COMM 393/393X	Technical Writing	3 credit hours
BIOL 350	Molecular and Cellular Biology	3 credit hours
BIOL 400	Life Science Seminar or NSCI 301 or Other supplemental major course	3 credit hours
BIOL 320	Forensic Biology or Other supplemental major course	3 credit hours

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PROGRAM OF STUDY (continued)

BIOL 362	Neurobiology or other supplemental major course	3 credit hours
BIOL 422	Epidemiology of Emerging Infections or Other supplemental major course	3 credit hours
BIOL 486A/B	Internship (with relationship to major)	6 credit hours

MINOR AND ELECTIVE COURSES

30 credit hours

Minor and/or elective courses are to be taken in the last 60 hours along with required major courses. Refer to the current UMUC School of Undergraduate Studies Catalog for the minor and/or elective course requirements.

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DEVELOPMENT OF PROGRAM OUTCOMES

The following table identifies the curricular influences that support the program outcomes specific to the Baccalaureate Degree Program in Biotechnology.

SOURCES/RESOURCES PROVIDING CURRICULAR FOUNDATION FOR PROGRAM OUTCOMES		
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SOURCE	DESCRIPTION	WEB ADDRESS OR DOCUMENT NAME (if applicable)
Core Learning Areas of the UMUC School of Undergraduate Studies	<p>All UMUC degree programs are required to imbed identified Core Learning Areas into the program of study. The Core Learning Areas are:</p> <ul style="list-style-type: none"> • Written Communication (COMM) • Technology Fluency (TECH) • Information Literacy (INFO) • Quantitative Literacy (QUAN) • Critical Thinking (THIN) • Scientific Literacy (SCIE) <p>The expanded definition for each Core Learning Area was considered in creating the respective program outcome.</p>	UMUC <u>Institutional Plan for the Assessment of Student Learning</u>
Biotech Workforce and Education Survey in the I-270 Corridor	The Biotech Workforce and Education Survey in the I-270 Corridor is a report commissioned by the Maryland Technology Council and conducted by Snyder Consulting Services. The report was commissioned to investigate and identify the educational knowledge, skills, and abilities required for employment in Maryland's biotechnology industry.	
Bio2010: Transforming Undergraduate Education for Future Research Biologists (2003)	The National Academies report, Bio2010: Transforming Undergraduate Education for Future Research Biologists, provides guidelines for curriculum emphases in professional science education.	<u>http://dels.nas.edu/dels/sp_products.shtml</u>

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PROGRAM OUTCOMES

The program outcomes specific to the Baccalaureate Degree Program in Biotechnology are delineated below. The program outcomes describe the expectations for all graduates of the Baccalaureate Degree Program in Biotechnology.

CORE LEARNING AREA	PROGRAM OUTCOMES Baccalaureate Degree Program in Biotechnology
	Upon completion of the Baccalaureate Degree Program in Biotechnology, graduates will be able to:
COMM	Create written communication appropriate for the purpose and which meets standards of style and grammatical correctness.+
	Formulate a research proposal to investigate a current topic in the life sciences.*
TECH	Evaluate technological concepts related to computers and components of information systems. +
	Identify the appropriate instrumentation and software for collection, measurement, and analysis of life sciences data.*
INFO	Address recognized research needs by retrieving, evaluating, and using information appropriately.+
	Utilize library databases to locate current journal articles on topics in the life sciences.*
QUAN	Apply mathematical and numerical reasoning skills.+
	Convert common laboratory units.*
THIN	Evaluate the impact of emerging disease on programs in biotechnology and public health.*
SCIE	Identify key concepts and principles of natural sciences.+
	Design an experiment to test a hypothesis in biotechnology or public health.*

+ Denotes a program outcome specific to core skills, knowledge, and values gained from completion of the general education requirements. This program outcome is common across all UMUC baccalaureate degree programs.

* Denotes a program outcome specific to core skills, knowledge, and values gained from completion of requirements in the baccalaureate degree program. This program outcome is unique to each UMUC baccalaureate degree program.

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ALIGNMENT OF PROGRAM OUTCOMES WITH LEARNING OBJECTIVES AND ASSESSMENT METHODS

The following grid aligns the program outcomes of the Baccalaureate Degree Program in Biotechnology with: 1) learning objectives from the designated program coursework and 2) specific methods used to assess student learning within the degree program.

CURRICULAR ALIGNMENT			
Baccalaureate Degree Program in Biotechnology			
CORE LEARNING AREA	PROGRAM OUTCOMES	LEARNING OBJECTIVE(S) AND CORRELATING COURSEWORK	METHOD(S) OF ASSESSMENT
COMM	Create written communication appropriate for the purpose and which meets standards of style and grammatical correctness.+	Plan and write a research-based essay that makes effective use of resources found in databases available from UMUC's Office of Information and Library Services as well as resources located through Web search engines. (WRTG 101)	Research Paper
		Research, compile, and document relevant, credible information and use it to support ideas presented in your writing. (WRTG 393)	Research Paper
		Collect, select, analyze, interpret, and organize data, and use it appropriately in business communications, including a long formal report. (WRTG 394)	Research Paper
		Conduct a systematic audience analysis and apply it to a report, essay, or research paper. (WRTG 391)	Research Paper
	Formulate a research proposal to investigate a current topic in the life sciences.*	Develop an ability to read and critically analyze primary research literature in the life sciences. (BIOL 400)	Research Paper

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CURRICULAR ALIGNMENT			
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CORE LEARNING AREA	PROGRAM OUTCOMES	LEARNING OBJECTIVE(S) AND CORRELATING COURSEWORK	METHOD(S) OF ASSESSMENT
TECH	Evaluate technological concepts related to computers and components of information systems.+	Analyze issues faced by information system professionals, including security, ethical, and privacy problems. (IFSM 201)	Exam (Course/Chapter)
	Identify the appropriate instrumentation and software for collection, measurement, and analysis of life sciences data.*	Select and describe methods and software necessary to collect, measure, and analyze experimental data in cell and molecular biology (BIOL 350).	Research Paper
INFO	Address recognized research needs by retrieving, evaluating, and using information appropriately.+	Select relevant print and electronic sources to answer research questions. (LIBS 150)	Exam (Course/Chapter)
	Utilize library databases to locate current journal articles on topics in the life sciences.*	Develop an ability to use libraries and other sources to locate, evaluate, and use information effectively. (BIOL 400)	Exam (Course/Chapter)
QUAN	Apply mathematical and numerical reasoning skills.+	Solve linear, quadratic, higher-order polynomial, fractional, radical, exponential, logarithmic, and absolute value equations and inequalities. (MATH 107)	Exam (Course/Chapter)
		Develop problem solving skills. (MATH 105 or MATH 106)	Exam (Course/Chapter)
	Convert common laboratory units.*	Use quantitative reasoning and critical thinking to analyze information and solve problems. (BIOL 320)	Project (Course/Chapter)
THIN	Evaluate the impact of emerging disease on programs in biotechnology and public health.*	Analyze how a confluence of factors has contributed to the emergence or re-emergence of infectious diseases. (BIOL 422)	Research Paper

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CURRICULAR ALIGNMENT			
Baccalaureate Degree Program in Biotechnology			
CORE LEARNING AREA	PROGRAM OUTCOMES	LEARNING OBJECTIVE(S) AND CORRELATING COURSEWORK	METHOD(S) OF ASSESSMENT
SCIE	Identify key concepts and principles of natural sciences.+	Recognize the differences and the interrelationships among physics, chemistry, the earth sciences, and astronomy. (NSCI 100)	Exam (Course/Chapter)
		Explain the significance of DNA in determining the composition, characteristics, reproduction, and behavior of an organism. (BIOL 101)	Exam (Course/Chapter)
	Design an experiment to test a hypothesis in biotechnology or public health.*	Evaluate experimental results and conclusions found in primary research papers. (BIOL 350)	Project (Course/Chapter)

+ Denotes a program outcome specific to core skills, knowledge, and values gained from completion of the general education requirements. This program outcome is common across all UMUC baccalaureate degree programs.

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