

Department of Biology

Biotechnology

I. Introduction

Biotechnology major is an integrated, multidisciplinary field that covers a wide range of knowledge in biology, microbiology, cell biology, chemistry, biochemistry, genetic engineering and protein engineering. It focuses on the modification of organisms and biological systems to improve human health, advance agriculture, generate energy, and clean up the environment.

II. Objectives

Graduates from the Biotechnology program will have demonstrated:

- a. A clear understanding of the major biological concepts and biotechnology applications.
- b. An ability to develop and critique hypotheses and to design experiments, models, and/or calculations to address these hypotheses.
- c. The problem solving, analytical, and communication skills.
- d. An ability to read, evaluates, interpret, and apply numerical and general scientific information.
- e. An ability to read, write, and communicate in English.
- f. A familiarity with, and application of safety in good laboratory practices.
- g. Insights into the ethical concerns, dilemmas and trade-offs that have been expressed concerning biotechnology.

Careers – Graduates from our biotechnology major will be well prepared for entering biotechnology industry/private sector, academia, and government.

III. Period of Study and Degree Requirement

Time length: 4 years

Degree conferred: Bachelor of Science

The minimum credit requirement for graduation: 151.5 credits

IV. Discipline

Biotechnology

V. Main Courses

For details please refer to General Education Required Courses, Major Required Courses (Table 1), Major Elective Courses (Table 2).

VI. Practice-Based Courses

See Table 3

VII. Course Structure and Credit Requirements

General Education (GE) Required Courses: 66.5 credits;

General Education (GE) Elective Courses: 10 credits;

Major Foundational Courses: 16 credits;

Major Core Courses: 20 credits;

Major Elective Courses: 29 credits;

Undergraduate Thesis/Projects, Research Projects and Internship: 10 credits;

The minimum credit requirement for graduation: 151.5 credits.

VIII. Course Arrangement

Table 1: Major Required Course (Foundational and Core Courses)

Course Code	Course Name	Credits	Lab Credits	Hours/week	Terms	course to take the Advised term	Instruction language	Prerequisite	Dept.
BIO104	General Biology Laboratory	2	2	4	Spr.	1/Spr.	CH/ EN		BIO
BIO201	Biochemistry (Macromolecules)	3		3	Fall	2/F	CH/ EN		BIO
BIO203	Microbiology	3		3	Fall	2/F	CH/ EN		BIO
BIO202	Biochemistry (Metabolism)	3		3	Spr.	2/Spr.	CH/ EN	BIO201	BIO
BIO222	Biochemistry and Molecular Biology Laboratory	2	2	4	Spr.	2/Spr.	CH/ EN	BIO102 BIO201	BIO
BIO320	Molecular Biology	3		3	Spr.	2/Spr.	CH/ EN		BIO
Total		16	4	20					
BIO206	Cell Biology	4		4	Fall	3/F	CH/ EN		BIO
BIO301	Genetics	3		3	Fall	3/F	CH/ EN		BIO
BIO303	Genetics Laboratory	2	2	4	Fall	3/F	CH/ EN	BIO301	BIO
BIO208	Cell Biology Laboratory	2	2	4	Spr.	3/Spr.	CH/ EN	BIO102 BIO201 BIO203 BIO206	BIO
BIO302	Modern Biotechnology	3		3	Spr.	3/Spr.	CH/ EN	BIO104 BIO201 BIO204 BIO206 BIO301	BIO
BIO340	Protein Engineering	3		3	Spr.	3/Spr.	CH/ EN		BIO
BIO401	Genetic Engineering	3		3	Fall	4/F	CH/ EN	BIO201 BIO202 BIO203 BIO206 BIO301	BIO

Total		20	4	24					
BIO480*	Projects of Science and Technology Innovation	2	2	4					BIO
BIO490	Thesis	8	8	16					BIO

Table 2: Major Elective Courses

Course Code	Course Name	Credits	Lab Credits	Hours /week	Terms	Instruction language	Prerequisite	Dept.
Elective Courses in Chemistry								
CH102	General Chemistry Laboratory	1	1	2	1/Spr.			CHEM
CH203	Organic Chemistry I	4		4	2/Fall			CHEM
CH206	Organic Chemistry II	4		4	2/Spr.			CHEM
CH205	Analytical Chemistry	4		4	2/Fall			CHEM
CH313	Chemical Biology	3		3	3/Fall			CHEM
CH317	Medicinal Chemistry	3		3	4/Fall			CHEM
Elective Courses in Math and Physics								
MA212	Probability and Mathematical Statistics	3		3	2/Spr.		GE101 GE102 GE103b	MATH
Elective Courses in Biomedical Engineering								
BMEB131	Introduction to Biomedical Engineering	2		2	1/Spr.			BME
BMEB221	Biomedical Instrumentation	4	2	6	2/Spr.			BME
Elective Courses in Biology								
BIO211	Basic Synthetic Biology and Laboratory	2	1	3	1/Smr.	CH/EN	BIO102	BIO
BIO207	Plant Physiology	3		3	2/Fall	CH/EN	BIO102	BIO
BIO209	Plant Physiology Laboratory	2	2	4	2/Fall	CH/EN	BIO207	BIO
BIO205	Microbiology Laboratory	2	2	4	2/Fall	CH/EN	BIO102 BIO104 BIO203	BIO
BIO308	Frontier in Life Sciences Seminar and Journal Club	2		2	2/Spr.	CH/EN		BIO
BIO309	Computational Biology	3	1	4	3/Fall	CH/EN		BIO
BIO311	Animal Physiology	3		3	3/Fall	CH/EN	BIO102 BIO201 BIO202	BIO
BIO313	Animal Physiology Laboratory	2	2	4	3/Fall	CH/EN	BIO104 BIO311	BIO
BIO331	Protein Structure and Function	3	1	4	3/Fall	CH/EN	BIO201	BIO
BIO305	Model Organism and Developmental Biology	3		3	3/Fall	CH/EN	BIO102	BIO
BIO307	Model organism and Developmental Biology Laboratory	1	1	2	3/Fall	CH/EN	BIO104 BIO305	BIO

BIO323	Advanced Cell Biology	2		2	3/Spr.	CH/EN	BIO206	BIO
BIO304	Systems Biology	3		3	3/Spr.	CH/EN	GE103 BIO102 BIO201 BIO206 (or MA202)	BIO
BIO306	Bioinformatics	4	2	6	3/Spr.	CH/EN	BIO309	BIO
BIO310	Neurobiology	3		3	3/Spr.	CH/EN	BIO102 BIO201 BIO202 BIO206 BIO305	BIO
BIO332	Stem Cell and Regenerative Medicine	2		2	3/Spr.	CH/EN	BIO305	BIO
BIO327	Molecular Cell Biology Laboratory	1	1	2	3/Smr.	CH/EN	BIO102 BIO201 BIO203 BIO206 BIO208 BIO204	BIO
BIO330	Biomolecular Crystallography	2	1	3	3/Smr.	CH/EN	BIO331	BIO
BIO334	Advanced Techniques in Biological Microscopy	2		2	3/Smr.	CH/EN		BIO
BIO411	Dynamical Systems Simulation in Biology	3		3	4/Fall	CH/EN	BIO102 BIO206 BIO201 GE101 GE102 GE103b	BIO
BIO403	Molecular Pharmacology	3		3	4/Fall	CH/EN		BIO
BIO405	Immunology	3		3	4/Fall	CH/EN	BIO201 BIO202 BIO203 BIO206 BIO301	BIO
Total		82	17	99				
A minimum of 29 credits MUST be taken to fulfill Major Requirements.								

Table 3: Overview of Practice-Based Courses

Course Code	Course Name	Credits	Lab Credits	Hours /week	Terms	Instruction language	Prerequisite	Dept.
CH104	General Chemistry Laboratory	1	1	2	1/Spr.	CH/EN		CHEM
BIO104	General Biology Laboratory	2	2	4	1/Spr.	CH/EN		BIO
BIO211	Basic Synthetic Biology and Laboratory	2	1	3	1/Smr.	CH/EN	BIO102	BIO
BIO209	Plant Physiology Laboratory	2	2	4	2/Fall	CH/EN	BIO207	BIO
BIO205	Microbiology Laboratory	2	2	4	2/Fall	CH/EN	BIO102 BIO104 BIO203	BIO
BIO222	Biochemistry and Molecular Biology Laboratory	2	2	4	2/Spr.	CH/EN	BIO102 BIO201 BIO203 BIO202	BIO
BIO303	Genetics Laboratory	2	2	4	3/Fall	CH/EN	BIO301	BIO
BIO307	Model organism and Developmental Biology Laboratory	1	1	2	3/Fall	CH/EN	BIO104 BIO305	BIO
BIO309	Computational Biology	3	1	4	3/Fall	CH/EN		BIO
BIO313	Animal Physiology Laboratory	2	2	4	3/Fall	CH/EN	BIO104 BIO311	BIO
BIO331	Protein Structure and Function	3	1	4	3/Fall	CH/EN	BIO201	BIO
BO208	Cell Biology Laboratory	2	2	4	3/Spr.	CH/EN	BIO102 BIO201 BIO203 BIO206	BIO
BIO302	Modern Biotechnology	3	1	4	3/Spr.	CH/EN	BIO104 BIO201 BIO204 BIO206 BIO301 BIO301	BIO
BIO306	Bioinformatics	4	2	6	3/Spr.	CH/EN	BIO309	BIO

						CH/E N		
BIO330	Biomolecular Crystallography	2	1	3	3/Smr.	CH/E N	BIO331	BIO
BIO327	Molecular Cell Biology Laboratory	1	1	2	3/Smr.	CH/E N	BIO102 BIO201 BIO203 BIO206 BIO208 BIO204	BIO
BIO480	Research Projects	2	2	4				BIO
BIO490	Undergraduate Thesis/Projects	8	8	16				BIO
Total		44	34	78				

Table 4: Overview of Course Hours and Credits

Course Category	Total Course Hours	Total Credits	The Minimum Credit Requirement
General Education (GE) Required Courses	1168	66.5	66.5
General Education (GE) Elective Courses		10	10
Major Foundational Courses	320	16	16
Major Core Courses	400	20	20
Major Elective Courses	1584	82	29
Research Projects, and Undergraduate Thesis/Projects	416	10	10
Total		204.5	151.5