MAJOR IN BIOLOGY - CELLULAR, MOLECULAR & ORGANISMAL PHYSIOLOGY CONCENTRATION

Completion of this concentration provides background for advanced studies in cell biology, molecular biology, genetics, microbiology, immunology, and physiology. In addition, students may select this concentration as preparation for professional degree programs in medicine, dentistry or veterinary medicine or for a career in biomedical research or fields that integrate biology with other disciplines such as business or law. Students completing this concentration are encouraged to take at least two upper-level labs among the elective courses within this concentration. Students are encouraged to participate in a research experience or as an intern (e.g., BIOL 491, BIOL 493 or BIOL 499). They should consult with their adviser regarding these opportunities.

Specific requirements for the Cellular, Molecular & Organismal Physiology concentration are listed under Requirements and outlined in the suggested Four-Year Plan of Study. A complete list of Biology courses that ***do not*** count towards the Biology major may be found on the Resources for Students web page.

Requirements

The Cellular, Molecular and Organismal Physiology Concentration consists of 53-73 units. All Biology majors must complete minimum 19 units toward the major at Towson University, with at least 10 of these units at the upper (300-400) level. Courses taken to fulfill Ancillary Course requirements do not count toward units in residence.

Code	Title	Units
Foundation Courses		
BIOL 200 & 200L	BIOLOGY I: INTRODUCTION TO CELLULAR BIOLOGY AND GENETICS [LECTURE] and BIOLOGY I: INTRODUCTION TO CELLULAR BIOLOGY AND GENETICS [LAB] [1]	4
BIOL 204	EDUCATIONAL AND CAREER PLANNING FOR THE BIOLOGIST	1
BIOL 206 & 206L	BIOLOGY II: INTRODUCTION TO ECOLOGY AND EVOLUTION [LECTURE] and BIOLOGY II: INTRODUCTION TO ECOLOGY AND EVOLUTION [LAB]	4
Intermediate Courses: Genetics, Biodiversity and Physiology		
BIOL 309	GENETICS	4
Select one Biodiversity option from the following:		3-8
BIOL 205 & BIOL 207	GENERAL BOTANY and GENERAL ZOOLOGY	
BIOL 208	BIODIVERSITY	
Select one Physiology option from the following:		3-8
BIOL 325	ANIMAL PHYSIOLOGY [2]	
BIOL 436	PLANT PHYSIOLOGY	
BIOL 342 & BIOL 343	HUMAN ANATOMY AND PHYSIOLOGY I FOR BIOLOGY MAJORS and HUMAN ANATOMY AND PHYSIOLOGY II FOR BIOLOGY MAJORS [1]	
Ancillary Courses		
Chemistry		
CHEM 131 & 131L	GENERAL CHEMISTRY I LECTURE and GENERAL CHEMISTRY I LABORATORY	4
CHEM 132 & 132L	GENERAL CHEMISTRY II LECTURE and GENERAL CHEMISTRY II LABORATORY	4
CHEM 333 & 333L	ESSENTIALS OF ORGANIC CHEM [LECTURE] and ESSENTIALS OF ORGANIC CHEMISTRY LABORATORY	5-8
or CHEM 334 & CHEM 336 & CHEM 337	ORGANIC CHEMISTRY I [LECTURE] and INTRODUCTORY ORGANIC CHEMISTRY LABORATORY and ORGANIC CHEMISTRY II [LECTURE]	
Mathematics		
Select one of the following:		3-4
MATH 211	CALCULUS FOR APPLICATIONS	
MATH 237	ELEMENTARY BIOSTATISTICS	
MATH 273	CALCULUS I	
PSYC 212	BEHAVIORAL STATISTICS	
Physics		
PHYS 211	GENERAL PHYSICS I; NON CALCULUS-BASED	4
or PHYS 241	GENERAL PHYSICS I CALCULUS-BASED	
Cellular, Molecular and Organismal Physiology Concentration Courses		
Select two of the following courses:		7-8
BIOL 408	CELL BIOLOGY	
BIOL 409	MOLECULAR BIOLOGY	
BIOL 470	ADVANCED PHYSIOLOGY	
CHEM 351	BIOCHEMISTRY	
Electives		
Select minimum three upper (300-400) level elective courses. Minimum two courses must be from the following list of Cellular, Molecular and Organismal Physiology Concentration Electives. The remaining course may be selected from the list or from any course not already taken that may be counted toward any concentration of the major (excluding ancillary and UTeach courses). One elective course must be a lecture/laboratory course, a laboratory course, or BIOL 491.		7-12
Total Units		**53-73**

Code	Title	Units
Cellular, Molecular and Organismal Physiology Concentration Electives		
BIOL 305	ELECTRON MICROSCOPY	4
BIOL 318	MICROBIOLOGY	4
BIOL 355	ANIMAL PARASITOLOGY	3
BIOL 360	HISTOLOGY	4
BIOL 365	HUMAN PATHOPHYSIOLOGY	3
BIOL 367	ENDOCRINOLOGY	3

BIOL 403	ADV GENETICS	3
BIOL 408	CELL BIOLOGY (if not taken as required)	4
BIOL 409	MOLECULAR BIOLOGY (if not taken as required)	4
BIOL 410	MOLECULAR BIOLOGY LABORATORY	3
BIOL 411	CANCER BIOLOGY	3
BIOL 412	CELL BIOLOGY LABORATORY	3
BIOL 415	BIOTECHNOLOGY	3
BIOL 417	METABOLIC PATHWAYS	3
BIOL 418	GENETIC ANALYSIS IN MEDICINE	3
BIOL 419	ENVIRONMENTAL MICROBIOLOGY	3
BIOL 420	MICROBIOLOGY OF INFECTIOUS DISEASE	3
BIOL 421	IMMUNOLOGY	4
BIOL 427	NEUROMUSCULAR MECHANISMS OF THE UPPER BODY	2
BIOL 428	VIROLOGY	3
BIOL 463	DEVELOPMENTAL BIOLOGY	4
BIOL 470	ADVANCED PHYSIOLOGY (if not taken as required)	4
BIOL 474	MOLECULAR TECHNIQUES IN ECOLOGY, EVOLUTION, AND CONSERVATION	3
BIOL 475	GENETICS LABORATORY	3
CHEM 351	BIOCHEMISTRY	3
CHEM 356	BIOCHEMISTRY LAB	2
MBBB 301	INTRO TO BIOINFORMATICS	4
MBBB 315	GENOMICS	3

[1] Students may substitute BIOL 191/BIOL 191L for BIOL 200/BIOL 200L if an A- or better is earned in each course component.

[2] Only one of BIOL 325 or BIOL 342 many be counted toward the major.

Departmental Research Honors Program

The Department of Biological Sciences' Research Honors program allows undergraduates to develop their critical thinking and research skills in a rigorous and collaborative environment. The program is a two-semester sequence of independent study, the culmination of which is the writing and public presentation and defense of a research thesis—a significant scholarly research paper prepared under the close supervision of a faculty member and one additional research thesis committee member.

Students who are interested in pursuing departmental research honors will need to contact a potential research mentor toward the beginning of their junior year. Once accepted by the research mentor, students should consult the Department Chair or the Departmental Honors Thesis Coordinator. Students will register for BIOL 491 under the supervision of their research mentor in one semester, and then BIOL 499 in the next semester. Students must receive a grade of ≥ B in BIOL 491 in order to register for BIOL 499.

Departmental Research Honors are designated on a graduate's transcript when a student successfully completes BIOL 499, which requires a written thesis and a public seminar and a thesis defense in front of the student's thesis committee. Students pursuing departmental research honors are not required to be members of the Honors College. Departmental research honors are distinct from Latin honors (*cum laude*, etc.) and from enrollment in the Honors College.

Code	Title	Units
Required Course Work for Departmental Honors in Biology		
BIOL 491	ELECTIVE IN INDEPENDENT RESEARCH	3
BIOL 499	HONORS SENIOR THESIS IN BIOLOGY	3
Total Units		**6**

Four-Year Plan

Sample Four-Year Plan

The selected course sequence below is an example of the simplest path to degree completion. Based on course schedules, student needs, and student choice, individual plans may vary. Students should consult with their adviser to make the most appropriate elective choices and to ensure that they have completed the required number of units (120) to graduate.

Freshman

Term 1	Units	Term 2	Units
BIOL 200 & 200L	4	BIOL 206 & 206L	4
MATH 115 or 119 (Core 3)[1]	3	CHEM 131 & 131L (Core 7)	4
Core 1 (or Core 2)	3	MATH 211, 237, 273, or PSYC 212	3-4
Core 4	3	Core 2 (or Core 1)	3
Core 5	3	Core 12	3
	16		**17-18**

Sophomore

Term 1	Units	Term 2	Units
BIOL 205 or 208	4	BIOL 207 (or elective)	4
BIOL 204[2]	1	Required Elective	4
BIOL 309	4	PHYS 211 or 241[4]	4
CHEM 132 & 132L (Core 8)	4	Core 9	3
Core 10	3	Elective	3
	16		**18**

Junior

Term 1	Units	Term 2	Units
BIOL 325, 342, or 436[5]	4	BIOL 343 (or elective)[5]	4
CHEM 333 & 333L	3-5	CHEM 336 & CHEM 337	5
OR		Required Elective	3-4
CHEM 334		Elective	3-4
Core 6	3		
Required Elective	4		
	14-16		**15-17**

Senior

Term 1	Units	Term 2	Units
Select two of the following:	7-8	Core 11	3
BIOL 408		Core 13	3
BIOL 409		Elective	3
BIOL 470		Elective	3
CHEM 351			
Core 14	3		

Elective	3	
	13-14	**12**

Total Units 121-127

1 MATH 237 and PSYC 212 can be substituted for a Calculus course depending on career objectives. Consult your adviser.
2 A major assignment in BIOL 204 is the development of your own Degree Completion Plan.
3 CHEM 333 & CHEM 333L can be substituted for CHEM 334 and CHEM 336 & CHEM 337 depending on career objectives. Consult your adviser.

Learning Outcomes

1. Explain the core concepts and principles of Biology.
2. Demonstrate the scientific method through the use of hypothesis testing in the design and implementation of an experiment.
3. Utilize scientific methodologies from the biological sciences in the evaluation of issues in society.
4. Apply appropriate critical-thinking/problem-solving skills in biological sciences.
5. Communicate both verbally and in writing in discipline specific contexts.
6. Identify fundamental similarities and differences among various fields of study within the Biological Sciences.