MAJOR IN BIOLOGY - SECONDARY EDUCATION CONCENTRATION

The Biology Secondary Education concentration requires 123-136 units. Students in this concentration must complete 93-106 required units in content and Towson UTeach courses and 30 units in Core Curriculum courses not satisfied by the major, earning a grade equivalent of 2.00 or higher in each course.

Students who decide not to complete all secondary education requirements must select and complete a different concentration/track in the major in order to graduate.

Teacher Candidacy Standards for Teacher Education

The Teacher Education Executive Board, representing all initial teacher education programs at Towson University, utilizes the following **minimum** requirements as conditions for admission into teacher education programs, maintaining candidate status and formal entry into the capstone internship. Programs may include additional requirements for admission into the program and/or the capstone internship.

The College of Education admits students either as freshmen or as undergraduate transfer students from accredited, post-secondary institutions. During the freshman and sophomore years, students are generally engaged in pre-professional courses or courses that fulfill Core Curriculum requirements, as well as all identified prerequisites (e.g., specific and sequential courses in Core Curriculum) for admission to COE screened majors and programs.

All College of Education undergraduate programs are screened majors. As an integral part of the teaching/learning experience, students work with advisers in a strategic planning process across all years at TU. Accordingly, to support student success, all COE students are required to confer prior to registration each term with their assigned advisers.

I. PROCEDURES AND REQUIREMENTS FOR ADMISSION TO ALL TEACHER EDUCATION PROGRAMS

1. Complete a self-disclosure criminal background form to be submitted to the major department with the application.
2. Submit an application for formal admission to the program. Students seeking admission to teacher education programs must contact their department chairperson or program coordinator by 45 credit hours for program-specific procedures and requirements for admission to professional education programs.
3. A cumulative/overall GPA of 3.00 or higher is required for admission to an initial licensure teacher education program.

    i. Applicants with a GPA between 2.50 - 2.99 may be admitted conditionally if they provide evidence of passing scores on a Basic Skills Assessment* as identified by the Maryland State Department of Education (i.e. SAT, ACT, GRE, Praxis Core) and receive approval from the department chairperson/program coordinator.

    **Candidates may apply for a test waiver directly to the department. Such waivers should only be granted if it is predicted, based on the individual candidate's transcript data, that the candidate's final cumulative/overall GPA will be above a 3.00.*

II. REQUIREMENTS FOR MAINTAINING CANDIDATE STATUS

A. Maintain a semester GPA of 3.00 in required education courses for all programs.
    i. At the department's discretion, candidates who do not meet the above GPA requirement may continue for one additional semester under probationary status, but must meet the 3.00 GPA requirement at the end of the probationary period. If the GPA requirement is not met at the end of the probationary period, the candidate would be dismissed from the program.
B. Obtain a grade of C or better in academic major course work applicable only in programs requiring an academic major. (Middle School; Secondary; Art, Dance, Health, Music, World Languages, Physical Education).
C. Exhibit behavior that is consistent with the University's Code of Student Conduct, the Educator Preparation Program's Professional Behavior Policy, and established professional practice in educational and clinical settings. (see COE Behavior Policy)

III. PROCEDURES AND REQUIREMENTS FOR ENTRY INTO CAPSTONE INTERNSHIP FOR ALL PROFESSIONAL EDUCATION PROGRAMS.

A. Complete a criminal background check as required by the school system in which the internship is located.
B. Complete all required course work.

The Standards were revised and approved in February 1996, May 1998, February 2000, May 2007, May 2008, April 2009, December 2011, November 2012, February 2014, October 2014, February 2015, November 2015, May 2019, February 2020, and March 2021.

Requirements

The Biology Secondary Education Concentration consists of 97-107 units. All Biology majors must complete minimum 19 units toward the major in residence 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.

Minimum requirements for admission into teacher education programs, maintaining candidate status and formal entry into the capstone internship are outlined on the Standards for Teacher Education page in the Undergraduate Catalog.

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 205	GENERAL BOTANY	4
BIOL 207	GENERAL ZOOLOGY	4
BIOL 309	GENETICS	4
Select one Physiology option from the following:		4-8
BIOL 325	ANIMAL PHYSIOLOGY	
or BIOL 342 & BIOL 343	HUMAN ANATOMY AND PHYSIOLOGY I FOR BIOLOGY MAJORS and HUMAN ANATOMY AND PHYSIOLOGY II FOR BIOLOGY MAJORS	
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]	
Physics		4
PHYS 211	GENERAL PHYSICS I; NON CALCULUS-BASED	
or PHYS 241	GENERAL PHYSICS I CALCULUS-BASED	
Mathematics		
Select one of the following:		3-4
MATH 211	CALCULUS FOR APPLICATIONS	
MATH 231	BASIC STATISTICS	
MATH 237	ELEMENTARY BIOSTATISTICS	
MATH 273	CALCULUS I	
Secondary Education Concentration Courses		
BIOL 408	CELL BIOLOGY	4
or BIOL 409	MOLECULAR BIOLOGY	
SCIE 380	TEACHING SCIENCE IN THE SECONDARY SCHOOLS	3
Select one from the following:		3-4
ASTR 161	THE SKY AND THE SOLAR SYSTEM	
GEOG 377	METEOROLOGY	
GEOL 121	PHYSICAL GEOLOGY	
GEOL 123	HISTORICAL GEOLOGY	
Elective		
Select one elective course from the list below in consultation with major advisor:		3-4
BIOL 304	NATURAL HISTORY INTERPRETATION AND PUBLIC ENVIRONMENTAL EDUCATION	
BIOL 310	CONSERVATION BIOLOGY	
BIOL 318	MICROBIOLOGY	
BIOL 334	HUMANS, SCIENCE AND THE CHESAPEAKE BAY	
BIOL 347	MARINE BIOLOGY	
BIOL 353	INVERTEBRATE ZOOLOGY	
BIOL 355	ANIMAL PARASITOLOGY	
BIOL 371	ANIMAL BEHAVIOR	
BIOL 402	GENERAL ECOLOGY	
BIOL 403	ADV GENETICS	
BIOL 406	LIMNOLOGY	
BIOL 411	CANCER BIOLOGY	
BIOL 413	EVOLUTION	
BIOL 415	BIOTECHNOLOGY	
BIOL 420	MICROBIOLOGY OF INFECTIOUS DISEASE	
BIOL 421	IMMUNOLOGY	
BIOL 428	VIROLOGY	
BIOL 435	PLANT ECOLOGY	
BIOL 444	WILDLIFE MANAGEMENT	
BIOL 446	TROPICAL ECOLOGY AND CONSERVATION	
BIOL 452	WETLAND ECOLOGY	
BIOL 455	FISH BIOLOGY	
BIOL 456	ORNITHOLOGY	
BIOL 458	MAMMALOGY	
BIOL 461	ENTOMOLOGY	
BIOL 463	DEVELOPMENTAL BIOLOGY	
BIOL 467	HERPETOLOGY	
BIOL 491	ELECTIVE IN INDEPENDENT RESEARCH	
Total Units		**58-68**

Towson UTeach Course Requirements

Code	Title	Units
SEMS 110 & SEMS 120	INTRODUCTION TO STEM TEACHING I: INQUIRY APPROACHES TO TEACHING and INTRODUCTION TO STEM TEACHING II: INQUIRY-BASED LESSON DESIGN [2]	2
or SEMS 130	INTRODUCTION TO STEM TEACHING I & II COMBINED	
SEMS 230	KNOWING AND LEARNING	3
Foundation Courses		
SEMS 240	CLASSROOMS INTERACTIONS	3
SEMS 250	PERSPECTIVES IN SCIENCE AND MATHEMATICS	3
Requirements Open to Formally Admitted Students		
SEMS 260	DIVERSITY AND DIFFERENCE IN THE STEM CLASSROOM	3
SCED 460	USING LITERACY IN THE SECONDARY SCHOOLS	3
SCED 461	TEACHING LITERACY IN THE SECONDARY CONTENT AREAS	3
SCIE 393	INTERNSHIP IN SECONDARY EDUCATION-SCIENCE	12
SEMS 370	PROJECT-BASED INSTRUCTION	3
SEMS 430	SEMINAR IN APPRENTICE TEACHING	1
SEMS 498	INTERNSHIP IN MATHEMATICS AND SCIENCE SECONDARY EDUCATION	3
Total Units		**39**

[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] Permission of Towson UTeach Department required to take SEMS 130

Four-Year Plan of Study

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 (Core 7)	4	BIOL 206 & 206L (Core 8)	4
CHEM 131 & 131L	4	CHEM 132 & 132L	4
MATH 211, 231, 237, or 273 (Core 3) (if prerequisites met)	3-4	SEMS 120	1
SEMS 110[1]	1	Core 2 (or Core 1)	3
Core 1 (or Core 2)	3	Core	3
Core	3	Core	3
	18-19		**18**

Sophomore

Term 1	Units	Term 2	Units
BIOL 204[2]	1	BIOL 205	4
BIOL 207	4	SEMS 240	3
BIOL 309	4	CHEM 333 & 333L	5
SEMS 230	3	Core	3
Core	3		
	15		**15**

Junior

Term 1	Units	Term 2	Units
BIOL Elective	3-4	PHYS 211	4
BIOL 325	4	Physical Science Elective	3-4
SEMS 250 (Core 5)	3	SCED 460	3
SEMS 260 (Core 13)	3	SEMS 370	3
Core	3	Core	3
	16-17		**16-17**

Senior

Term 1	Units	Term 2	Units
BIOL 408	4	SCIE 393	12
SCED 461	3	SEMS 430	1
SCIE 380	3		
SEMS 498	3		
	13		**13**

Total Units 124-127

[1] Selection of this Concentration means that all of the requirements must be met; otherwise another Biology concentration must be completed.

[2] A key assignment in BIOL 204 is the completion of an individual Plan of Study. Also, it is offered in Minimester and Summer too.

Learning Outcomes

NSTA Standard 1: Content Knowledge

Effective teachers of science understand and articulate the knowledge and practices of contemporary science. They interrelate and interpret important concepts, ideas, and applications in their fields of licensure. Below are the elements of the standard.
Pre-service teachers will:
1a) Understand the major concepts, principles, theories, laws, and interrelationships of their fields of licensure and supporting fields as recommended by the National Science Teachers Association.
1b) Understand the central concepts of the supporting disciplines and the supporting role of science-specific technology.
1c) Show an understanding of state and national curriculum standards and their impact on the content knowledge necessary for teaching P-12 students.
Assessment: Praxis II scores

NSTA Standard 2: Content Pedagogy

Effective teachers of science understand how students learn and develop scientific knowledge. Pre-service teachers use scientific inquiry to develop this knowledge for all students. Below are the elements of the standard.
Pre-service teachers will:
2a) Plan multiple lessons using a variety of inquiry approaches that demonstrate their knowledge and understanding of how all students learn science.
2b) Include active inquiry lessons where students collect and interpret data in order to develop and communicate concepts and understand scientific processes, relationships and natural patterns from empirical experiences. Applications of science-specific technology are included in the lessons when appropriate.
2c) Design instruction and assessment strategies that confront and address nave concepts/preconceptions.
Assessment: This Standard is usually met using Assessment 3 - Unit Plan. GPA required in content coursework.

NSTA Standard 3: Learning Environments

Effective teachers of science are able to plan for engaging all students in science learning by setting appropriate goals that are consistent with knowledge of how students learn science and are aligned with state and national standards. The plans reflect the nature and social context of science, inquiry, and appropriate safety considerations. Candidates design and select learning activities, instructional settings, and resources--including science-specific technology, to achieve those goals; and they plan fair and equitable assessment strategies to evaluate if the learning goals are met.
Below are the elements of the standard.
Pre-service teachers will:
3a) Use a variety of strategies that demonstrate the candidates knowledge and understanding of how to select the appropriate teaching and learning activities including laboratory or field settings and applicable instruments and/or technology- to allow access so that all students learn. These strategies are inclusive and motivating for all students.
3b) Develop lesson plans that include active inquiry lessons where students collect and interpret data using applicable science-specific technology in order to develop concepts, understand scientific processes,

relationships and natural patterns from empirical experiences. These plans provide for equitable achievement of science literacy for all students.
3c) Plan fair and equitable assessment strategies to analyze student learning and to evaluate if the learning goals are met. Assessment strategies are designed to continuously evaluate preconceptions and ideas that students hold and the understandings that students have formulated.
3d) Plan a learning environment and learning experiences for all students that demonstrate chemical safety, safety procedures, and the ethical treatment of living organisms within their licensure area.
Assessment: Curriculum Development Project (CDP) score

NSTA Standard 4: Safety

Effective teachers of science can, in a P-12 classroom setting, demonstrate and maintain chemical safety, safety procedures, and the ethical treatment of living organisms needed in the P-12 science classroom appropriate to their area of licensure.
Below are the elements of the standard.
Pre-service teachers will:
4a) Design activities in a P-12 classroom that demonstrate the safe and proper techniques for the preparation, storage, dispensing, supervision, and disposal of all materials used within their subject area science instruction.
4b) Design and demonstrate activities in a P-12 classroom that demonstrate an ability to implement emergency procedures and the maintenance of safety equipment, policies and procedures that comply with established state and/or national guidelines. Candidates ensure safe science activities appropriate for the abilities of all students.
4c) Design and demonstrate activities in a P-12 classroom that demonstrate ethical decision-making with respect to the treatment of all living organisms in and out of the classroom. They emphasize safe, humane, and ethical treatment of animals and comply with the legal restrictions on the collection, keeping, and use of living organisms.
Assessment: Internship Evaluations

NSTA Standard 5: Impact on Student Learning

Effective teachers of science provide evidence to show that P-12 students understanding of major science concepts, principles, theories, and laws have changed as a result of instruction by the candidate and that student knowledge is at a level of understanding beyond memorization. Candidates provide evidence for the diversity of students they teach.
Below are the elements of the standard.
Pre-service teachers will:
5a) Collect, organize, analyze, and reflect on diagnostic, formative and summative evidence of a change in mental functioning demonstrating that scientific knowledge is gained and/or corrected.
5b) Provide data to show that P-12 students are able to distinguish science from non-science, understand the evolution and practice of science as a human endeavor, and critically analyze assertions made in the name of science.
5c) Engage students in developmentally appropriate inquiries that require them to develop concepts and relationships from their observations, data, and inferences in a scientific manner.
Assessment: Portfolio scores

Standard 6: Professional Knowledge and Skills

Effective teachers of science strive continuously to improve their knowledge and understanding of the ever changing knowledge base of both content, and science pedagogy, including approaches for addressing inequities and inclusion for all students in science. They identify with and conduct themselves as part of the science education community.
Below are the elements of the standard.
Pre-service teachers will:
6a) Engage in professional development opportunities in their content field such as talks, symposiums, research opportunities, or projects within their community.
6b) Engage in professional development opportunities such as conferences, research opportunities, or projects within their community.
Assessment: Flinn Science Safety Course completion