MAJOR IN PHYSICS - SECONDARY EDUCATION CONCENTRATION

Physics majors in the Secondary Education Concentration are eligible, upon graduation, to apply for certification to teach physics for grades 7-12 in the state of Maryland.

The Physics Secondary Education Concentration requires 123-124 units for completion. Students in this concentration must complete 96-97 required units in content and Towson UTeach courses, and 27 units in Core Curriculum courses not satisfied by the major, earning a grade equivalent of 2.00 or higher in each course.

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 Physics Secondary Education concentration requires 123-124 units for completion. Students in this concentration must complete 96-97 required units in content and Towson UTeach courses, and 27 units in Core Curriculum courses not satisfied by the major, earning a grade equivalent of 2.00 or higher in each course.

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.

Required Physics Courses

Code	Title	Units
Required Physics Courses		
PHYS 185	INTRODUCTORY SEMINAR IN PHYSICS	1
Select one of the following sequences:		8
PHYS 241 & PHYS 242	GENERAL PHYSICS I CALCULUS-BASED and GENERAL PHYSICS II CALCULUS-BASED	
PHYS 251 & PHYS 252	HONORS GENERAL PHYSICS I CALCULUS-BASED and HONORS GENERAL PHYSICS II CALCULUS-BASED	
PHYS 243	GENERAL PHYSICS III	4
PHYS 305	COMPUTERS IN PHYSICS	4

PHYS 307	INTRODUCTORY MATHEMATICAL PHYSICS	3
PHYS 311	MODERN PHYSICS I	3
PHYS 341	INTERMEDIATE PHYSICS LABORATORY I	3
PHYS 351	MECHANICS	4
PHYS 354	ELECTRICITY AND MAGNETISM	4
Non-Physics Requirements		
MATH 273 & MATH 274	CALCULUS I and CALCULUS II	8
Total Units		**42**

Required Content Courses for the Secondary Education Concentration

In addition to the 24 units of common physics requirements and 8 units of common non-physics requirements for a physics major, the following content courses are required:

Code	Title	Units
Additional Physics Content Requirements		
PHYS 385	PHYSICS SEMINAR	1
Select one upper-level physics elective from the following:		3-4
PHYS 312	MODERN PHYSICS II	
PHYS 335	BASIC ELECTRONICS	
PHYS 337	DIGITAL ELECTRONICS	
PHYS 342	INTERMEDIATE PHYSICS LABORATORY II	
PHYS 352	THERMODYNAMICS AND KINETIC THEORY	
PHYS 361	OPTICS FUNDAMENTALS	
PHYS 495	RESEARCH PROBLEMS IN PHYSICS	
Additional Non-Physics Content Requirements		
ASTR 161	THE SKY AND THE SOLAR SYSTEM	4
BIOL 120 & 120L	PRINCIPLES OF BIOLOGY [LECTURE] and PRINCIPLES OF BIOLOGY [LAB]	4
SCIE 380	TEACHING SCIENCE IN THE SECONDARY SCHOOLS	3
Total Units		**15-16**

Towson UTeach Course Requirements (39 Units)

Code	Title	Units
Introductory Towson UTeach Courses		
Students must complete either		
SEMS 110 & SEMS 120	INTRODUCTION TO STEM TEACHING I: INQUIRY APPROACHES TO TEACHING and INTRODUCTION TO STEM TEACHING II: INQUIRY-BASED LESSON DESIGN [1]	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
SEMS 260	DIVERSITY AND DIFFERENCE IN THE STEM CLASSROOM	3
Requirements Open to Formally Admitted Students		
SCED 460	USING LITERACY IN THE SECONDARY SCHOOLS	3
SCED 461	TEACHING LITERACY IN THE SECONDARY CONTENT AREAS	3
SEMS 370	PROJECT-BASED INSTRUCTION	3
SEMS 498	INTERNSHIP IN MATHEMATICS AND SCIENCE SECONDARY EDUCATION	3
SEMS 430	SEMINAR IN APPRENTICE TEACHING	1
SCIE 393	INTERNSHIP IN SECONDARY EDUCATION-SCIENCE	12
Total Units		**39**

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

Four-Year Plan of Study

Suggested Four-Year Plan

Based on course availability and student needs and preferences, the selected sequences will probably vary from those presented below. Students should consult with their adviser to make the most appropriate elective choices.

Freshman

Term 1	Units	Term 2	Units
CHEM 131 & 131L	4	PHYS 241 or 251 (Core 7)	4
MATH 273	4	MATH 274 (Core 3)	4
PHYS 185	1	SEMS 120	1
SEMS 110	1	Core 2 (or Core 1)	3
Core 1 (or Core 2)	3	Core 12	3
Core 4	3		
	16		**15**

Sophomore

Term 1	Units	Term 2	Units
ASTR 161	4	PHYS 243	4
PHYS 242 or 252 (Core 8)	4	PHYS 270	4
SEMS 230	3	PHYS 307	3
Core 6	3	SEMS 240	3
Core 10	3	Core 11	3
	17		**17**

Junior

Term 1	Units	Term 2	Units
BIOL 120 & 120L	4	PHYS 354	4
PHYS 311	3	PHYS 385	1
PHYS 341	3	SCED 461	3
SCED 460	3	SEMS 370	3
SEMS 250 (Core 5)	3	Core 13	3
		Core 14	3
	16		**17**

Senior		
Term 1	**Units Term 2**	**Units**
PHYS 351	4 SCIE 393	12
PHYS Upper-level Elective	3-4 SEMS 430	1
SCIE 380	3	
SEMS 498	3	
Core 9	3	
	16-17	**13**

Total Units 127-128

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