

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 entry into the capstone internship. Programs may include additional requirements for admission into the program and/or the capstone internship.

Educator Preparation Programs (EPP) admit 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 EPP initial licensure programs.

All EPP 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 EPP students are required to confer with their assigned advisers prior to registration each term.

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 units for program-specific procedures and requirements for admission to professional education programs.
3. Meet the Basic Skills Assessment Requirement as defined by the Maryland State Department of Education to be eligible for admission. A student who is admitted to Towson University and in Good Standing but does not meet the Basic Skills Assessment requirement at the time of application to the program can be granted "Conditional Admission" and given one semester as a conditional candidate to satisfy the Basic Skills Assessment requirement. If the conditional candidate does not meet the requirement by the end of the conditional semester, there are two options: 1) the program may recommend the conditional candidate for exemption and if granted,

the conditional candidate would be fully admitted to the program or
2) the conditional candidate will not be fully admitted to the program.

II. REQUIREMENTS FOR MAINTAINING CANDIDATE STATUS

- A. Meet the grade, course, and/or assessment requirement(s) identified by the candidate's specific program.
 - i. At the department's discretion, a candidate who does not meet the program requirement(s) may continue for one additional semester under probationary status but must satisfy the requirement by the end of the probationary period. If the requirement is not met at the end of the probationary period, the candidate will be dismissed from the program.
- B. 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 EPP 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 coursework.

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, March 2021, and November 2024.

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Requirements

Curricular requirements may be revised due to changes in state licensure requirements, and therefore, students should work with their adviser to ensure they are following the correct program plan.

The Physics Secondary Education concentration requires 126 units for completion. Students in this concentration must complete 99 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	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 34 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 Non-Physics Content Requirements		
ASTR 261	INTRODUCTION TO ASTROPHYSICS	4
BIOL 120 & 120L	PRINCIPLES OF BIOLOGY [LECTURE] and PRINCIPLES OF BIOLOGY [LAB]	4
CHEM 131 & 131L	GENERAL CHEMISTRY I LECTURE and GENERAL CHEMISTRY I LABORATORY	4
Total Units		12

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 250	PERSPECTIVES IN SCIENCE AND MATHEMATICS	3
SEMS 260	DIVERSITY AND DIFFERENCE IN THE STEM CLASSROOM	3
SEMS 340	CLASSROOM INTERACTIONS	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
SCIE 393	INTERNSHIP IN SECONDARY EDUCATION-SCIENCE	12
SEMS 375	SECONDARY SCIENCE PEDAGOGY & APPLICATION	6
SEMS 430	SEMINAR IN APPRENTICE TEACHING	1
SEMS 498	INTERNSHIP IN MATHEMATICS AND SCIENCE SECONDARY EDUCATION	6
Total Units		45

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	MATH 274	4
MATH 273 (Core 3)	4	PHYS 241 or 251 (Core 7)	4
PHYS 185	1	SEMS 110	1
SEMS 230	3	Core 2 (or Core 1)	3
Core 1 (or Core 2)	3	Core 4	3
		Core 6 ¹	3
	15		18
Sophomore			
Term 1	Units	Term 2	Units
ASTR 261 (Core 8)	4	PHYS 243	4

PHYS 242 or 252	4 PHYS 307	3
PHYS 305	4 BIOL 120 & 120L	4
SEMS 250 (Core 5)	3 SEMS 120	1
Core 10 ¹	3 SEMS 260 (Core 13)	3
	Core 11 ¹	3

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Junior

Term 1	Units Term 2	Units
PHYS 311	3 PHYS 354	4
PHYS 341	3 SCED 461	3
PHYS 351	4 Core 9	3
SEMS 340	3 Core 12	3
SCED 460	3 Core 14	3

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Senior

Term 1	Units Term 2	Units
SEMS 375	6 SCIE 393	12
SEMS 498	6 SEMS 430	1

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Total Units 126

¹ Students wishing to take less units during the fall / spring semester can opt to take a core course during a summer semester or minimester.

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