

MAJOR IN EARTH-SPACE SCIENCE - SECONDARY EDUCATION CONCENTRATION

Earth-Space Science Secondary majors in the Secondary Education Concentration are eligible, upon graduation, to apply for certification to teach earth-space science for grades 7-12 in the state of Maryland.

The Earth-Space Science Secondary Education Concentration requires 127-129 units for completion. Students in this concentration must complete 100-102 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.

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
Required Content Courses		
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
GEOG 373 or GEOG 377	CLIMATOLOGY METEOROLOGY	3
GEOL 121	PHYSICAL GEOLOGY	4
GEOL 123	HISTORICAL GEOLOGY	4
GEOL 305	ENVIRONMENTAL GEOLOGY	4
GEOL 331	MINERALOGY	4
GEOL 357	OCEANOGRAPHY	3
PHYS 211	GENERAL PHYSICS I; NON CALCULUS-BASED	4
PHYS 212	GENERAL PHYSICS II; NON CALCULUS-BASED	4
Geosciences or Geography Elective		
Select one of the following:		3-4
ASTR 301	COSMIC ORIGINS	
ASTR 371	PLANETARY ASTRONOMY	
GEOG 315	GEOMORPHOLOGY	
GEOG 410	ENVIRONMENTAL GEOGRAPHY	
GEOG 411	STUDIES IN NATURAL HAZARDS	
GEOL 321	STRUCTURAL GEOLOGY	
GEOL 415	HYDROGEOLOGY	
GEOL 443	SEDIMENTOLOGY AND STRATIGRAPHY	
Mathematics Elective		
Select one of the following:		3-4
MATH 115	COLLEGE ALGEBRA	
MATH 119	PRE-CALCULUS	
MATH 211	CALCULUS FOR APPLICATIONS	
MATH 273	CALCULUS I	
Total Units		48-50

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 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
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¹ 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 120 & 120L (Core 7)	4	GEOL 123	4
CHEM 131 & 131L (Core 8)	4	MATH 115, 119, 211, or 273 (Core 3)	3-4
GEOL 121	4	SEMS 110	1
SEMS 230	3	Core 2 (or Core 1)	3
Core 1 (or Core 2)	3	Core 4	3
	18		14-15

Sophomore

Term 1	Units	Term 2	Units
ASTR 261	4	PHYS 212	4
PHYS 211	4	SEMS 120	1
SEMS 250 (Core 5)	3	SEMS 260 (Core 13)	3
Core 6	3	Core 10	3
Core 9	3	Core 11	3
		Core 12	3
	17		17

Junior

Term 1	Units	Term 2	Units
GEOG 373 or 377	3	GEOL 305	4
GEOL 331	4	SCED 461	3

GEOL 357	3 Geosciences or GEOG Elective	3-4
SEMS 340	3 Core 14	3
SCED 460	3	
16		13-14
Senior		
Term 1	Units Term 2	Units
SEMS 375	6 SCIE 393	12
SEMS 498	6 SEMS 430	1
12		13
Total Units 120-122		

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

NSTA 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