

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.

Formal Admission to Towson UTeach

Students should apply to Towson UTeach when they have met the following criteria:

1. completion of a written application available at www.towson.edu/uteach
2. completion of at least 45 college units;
3. a minimum cumulative 2.75 overall GPA;
4. presentation of either a passing score on Praxis Core (Pre-Professional Skills Test: Reading, Writing, and Mathematics) OR an acceptable score on the Score Reporting Form for either the SAT, ACT, or GRE. Please refer to www.towson.edu/uteach for information on these assessments, including acceptable minimum passing scores;
5. completion of a Criminal History Disclosure Form. This form is to be notarized and submitted to the Towson UTeach Office. It will be forwarded and kept on file with the Center for Professional Practice.

Full-Time Internship in Towson UTeach

Students in this concentration should be prepared to do their internship in their senior year. Students who wish to deviate from this policy must obtain permission from the Department of Chemistry prior to the beginning of their junior year. The following requirements must be met for internship:

1. a minimum cumulative GPA of 2.75 in content courses required for the major;
2. a minimum cumulative GPA of 3.00 in professional education courses;
3. a minimum cumulative GPA of 2.75.

GPA calculations based on transcripts from all institutions of higher learning attended, including Towson University.

Code	Title	Units
Required Content Courses		
GEOL 121	PHYSICAL GEOLOGY	4
GEOL 123	HISTORICAL GEOLOGY	4
GEOL 357	PHYSICAL OCEANOGRAPHY	3
ASTR 161	THE SKY AND THE SOLAR SYSTEM	4
ASTR 181	STARS, GALAXIES, AND THE EARLY UNIVERSE	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
CHEM 132 & 132L	GENERAL CHEMISTRY II LECTURE and GENERAL CHEMISTRY II LABORATORY	4
PHYS 211	GENERAL PHYSICS I; NON CALCULUS-BASED	4
PHYS 212	GENERAL PHYSICS II; NON CALCULUS-BASED	4
GEOL 305	ENVIRONMENTAL GEOLOGY	4
GEOL 331	MINERALOGY	4
GEOG 377	METEOROLOGY	3

Geosciences or Geography Elective

Select one of the following:		3-4
ASTR 301	COSMIC ORIGINS	
ASTR 371	PLANETARY ASTRONOMY	
GEOL 321	STRUCTURAL GEOLOGY	
GEOL 415	HYDROGEOLOGY	
GEOL 443	SEDIMENTOLOGY AND STRATIGRAPHY	
GEOG 232	INTRO TO GEOGRAPHIC INFORMATION SCIENCE	
GEOG 315	GEOMORPHOLOGY	
GEOG 410	ENVIRONMENTAL GEOGRAPHY	
GEOG 411	STUDIES IN NATURAL HAZARDS	

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	

Science Education

SCIE 380	TEACHING SCIENCE IN THE SECONDARY SCHOOLS	3
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Total Units 59-61

Towson UTeach Courses (40 Units)

Code	Title	Units
Introductory 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	2
or SEMS 130	INTRODUCTION TO STEM TEACHING I & II COMBINED	
*Permission of Towson UTeach Department required to take SEMS 130.		
Core UTeach Courses		
SEMS 230	KNOWING AND LEARNING	3
SEMS 240	CLASSROOMS INTERACTIONS	3
SEMS 250	PERSPECTIVES IN SCIENCE AND MATHEMATICS	3
SEMS 360	RESEARCH METHODS	3
SEMS 370	PROJECT-BASED INSTRUCTION	3
SEMS 498	INTERNSHIP IN MATHEMATICS AND SCIENCE SECONDARY EDUCATION	3
SCED 460	USING READING AND WRITING IN THE SECONDARY SCHOOLS	4

SCED 461	TEACHING READING IN THE SECONDARY CONTENT AREAS	3
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Science Courses

SCIE 393	INTERNSHIP IN SECONDARY EDUCATION-SCIENCE	12
SCIE 430	SEMINAR IN STUDENT TEACHING - SCIENCE	1
Total Units		40

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
SEMS 110	1 SEMS 120	1
BIOL 120 & 120L	4 CHEM 132 & 132L	4
CHEM 131 & 131L (Core 7)	4 ENGL 102 (Core 2)	3
GEOL 121	4 GEOL 123	4
TSEM 102 (Core 1)	3 MATH 115, 119, 211, or 273 (Core 3)	3-4
	16	15-16

Sophomore

Term 1	Units Term 2	Units
SEMS 230	3 SEMS 240	3
ASTR 161 (Core 8)	4 ASTR 181	4
PHYS 211	4 PHYS 212	4
Core	3 Core	3
Core	3 Core	3
	17	17

Junior

Term 1	Units Term 2	Units
SEMS 250	3 SEMS 370	3
GEOL 357	3 GEOG 377	3
Geosciences or GEOG Elective	3-4 SCED 461	3
Core	3 Core	3
SCED 460	4 Core	3
	16-17	15

Senior

Term 1	Units Term 2	Units
SEMS 360 (Core 9)	3 SCIE 393	12
SEMS 498	3 SCIE 430	1
GEOL 305	4	
GEOL 331	4	
SCIE 380	3	
	17	13

Total Units 126-128

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:

- 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.
- Understand the central concepts of the supporting disciplines and the supporting role of science-specific technology.
- 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:

- Plan multiple lessons using a variety of inquiry approaches that demonstrate their knowledge and understanding of how all students learn science.
- 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.
- Design instruction and assessment strategies that confront and address naive 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:

- 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.
- 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.
- 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