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 (https://www.towson.edu/fcsm/departments/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:

- completion of a written application available online (http://www.towson.edu/uteach);
- completion of at least 45 college units;
- a minimum GPA of 3.00 in the last two years;
- a passing score on the Maryland State Department of Education Basic Skills Assessment Requirement (http://marylandpublicschools.org/about/Pages/DEE/Certification/testing_info/praxis1.aspx);
- completion of a Criminal History Disclosure Form. This form is to be notarized and submitted to the Towson UTeach Office.

Full-Time Internship in Towson UTeach
Students in a mathematics or science secondary education concentration complete their full-time internship in their final semester. The following requirements must be met for the final internship semester:

- a minimum GPA of 2.75 in content courses required for the major;
- a minimum GPA of 3.00 in required education courses;
- a minimum cumulative GPA of 3.00.

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

For more information see the Standards for Teacher Education (http://catalog.towson.edu/undergraduate/education/admission-teacher-education) page.

<table>
<thead>
<tr>
<th>Required Content Courses</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 132 &amp; 132L</td>
<td>GENERAL CHEMISTRY II LECTURE and GENERAL CHEMISTRY II LABORATORY</td>
</tr>
<tr>
<td>PHYS 211</td>
<td>GENERAL PHYSICS I; NON CALCULUS-BASED</td>
</tr>
<tr>
<td>PHYS 212</td>
<td>GENERAL PHYSICS II; NON CALCULUS-BASED</td>
</tr>
<tr>
<td>GEOL 305</td>
<td>ENVIRONMENTAL GEOLOGY</td>
</tr>
<tr>
<td>GEOL 331</td>
<td>MINERALOGY</td>
</tr>
<tr>
<td>GEOG 377</td>
<td>METEOROLOGY</td>
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Geosciences or Geography Elective
Select one of the following:

<table>
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<tr>
<th>Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>ASTR 301</td>
<td>COSMIC ORIGINS</td>
</tr>
<tr>
<td>ASTR 371</td>
<td>PLANETARY ASTRONOMY</td>
</tr>
<tr>
<td>GEOL 321</td>
<td>STRUCTURAL GEOLOGY</td>
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<tr>
<td>GEOL 415</td>
<td>HYDROGEOLOGY</td>
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<tr>
<td>GEOL 443</td>
<td>SEDIMENTOLOGY AND STRATIGRAPHY</td>
</tr>
<tr>
<td>GEOG 232</td>
<td>INTRO TO GEOGRAPHIC INFORMATION SCIENCE</td>
</tr>
<tr>
<td>GEOG 315</td>
<td>GEOMORPHOLOGY</td>
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<td>GEOG 410</td>
<td>ENVIRONMENTAL GEOGRAPHY</td>
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<tr>
<td>GEOG 411</td>
<td>STUDIES IN NATURAL HAZARDS</td>
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Mathematics Elective
Select one of the following:

<table>
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<tbody>
<tr>
<td>MATH 115</td>
<td>COLLEGE ALGEBRA</td>
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<tr>
<td>MATH 119</td>
<td>PRE-CALCULUS</td>
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<td>MATH 211</td>
<td>CALCULUS FOR APPLICATIONS</td>
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<td>MATH 273</td>
<td>CALCULUS I</td>
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Science Education
SCIE 380 | TEACHING SCIENCE IN THE SECONDARY SCHOOLS |

Total Units | 59-61 |

Towson UTeach Courses (40 Units)

<table>
<thead>
<tr>
<th>Code</th>
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</thead>
<tbody>
<tr>
<td>SEMS 110 &amp; SEMS 120</td>
<td>INTRODUCTION TO STEM TEACHING I: INQUIRY APPROACHES TO TEACHING and INTRODUCTION TO STEM TEACHING II: INQUIRY-BASED LESSON DESIGN</td>
</tr>
<tr>
<td>or SEMS 130</td>
<td>INTRODUCTION TO STEM TEACHING I &amp; II COMBINED</td>
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*Permission of Towson UTeach Department required to take SEMS 130.

Core UTeach Courses

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>SEMS 230</td>
<td>KNOWING AND LEARNING</td>
</tr>
<tr>
<td>SEMS 240</td>
<td>CLASSROOMS INTERACTIONS</td>
</tr>
<tr>
<td>SEMS 250</td>
<td>PERSPECTIVES IN SCIENCE AND MATHEMATICS</td>
</tr>
<tr>
<td>SEMS 360</td>
<td>RESEARCH METHODS</td>
</tr>
<tr>
<td>SEMS 370</td>
<td>PROJECT-BASED INSTRUCTION</td>
</tr>
<tr>
<td>SEMS 498</td>
<td>INTERNSHIP IN MATHEMATICS AND SCIENCE SECONDARY EDUCATION</td>
</tr>
<tr>
<td>SCED 460</td>
<td>USING READING AND WRITING IN THE SECONDARY SCHOOLS</td>
</tr>
<tr>
<td>SCED 461</td>
<td>TEACHING READING IN THE SECONDARY CONTENT AREAS</td>
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</table>

Science Courses
Pre-service teachers will:

Below are the elements of the standard.

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.

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 navel 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.

**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

<table>
<thead>
<tr>
<th>Term</th>
<th>Units</th>
<th>Term 2</th>
<th>Units</th>
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<tbody>
<tr>
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<td>3</td>
<td>CHEM 132 &amp; 132L (Core 8)</td>
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<td>CHEM 131 &amp; 131L (Core 7)</td>
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<td>GEOL 123</td>
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<td>GEOL 121</td>
<td>4</td>
<td>MATH 115, 119, 211, or 273 (Core 3)</td>
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<td>SEMS 120</td>
<td>1</td>
</tr>
<tr>
<td>Core 1 (or Core 2)</td>
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### Sophomore

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<td>SEMS 230</td>
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<td>SEMS 240</td>
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<tr>
<td>Core 4</td>
<td>3</td>
<td>Core 6</td>
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<tr>
<td>Core 12</td>
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<td>Core 10</td>
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### Junior

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<td>GEOG 305</td>
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<tr>
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<tr>
<td>SCED 460</td>
<td>3</td>
<td>SEMS 370</td>
<td>3</td>
</tr>
<tr>
<td>SEMS 250 (Core 5)</td>
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<td>Core 13</td>
<td>3</td>
</tr>
<tr>
<td>Core 11</td>
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<td>Core 14</td>
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### Senior

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<td>SCIE 393</td>
<td>12</td>
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<tr>
<td>SCED 461</td>
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<td>SCIE 430</td>
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<td>SEMS 360 (Core 9)</td>
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<td>SEMS 498</td>
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<tr>
<td>SCIE 380</td>
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<td><strong>13</strong></td>
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</table>

**Total Units 125-129**

**NSTA Standard 1: Content Knowledge**

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**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
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