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 128-129 units for completion. Students in this concentration must complete 101-102 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 2.75 cumulative GPA for all completed content courses required for the major
4. a 2.75 cumulative GPA for all completed Towson UTeach courses
5. presentation of either a passing score on Praxis I (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.
6. 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.

Capstone Internship in Towson UTeach
Students in this concentration should be prepared to do their capstone internship in their senior year. Students who wish to deviate from this policy must obtain permission from the Department of Physics, Astronomy, and Geosciences prior to the beginning of their junior year. The following requirements must be met for the capstone internship:

1. a minimum cumulative GPA of 2.75 in content courses required for the major
2. a minimum cumulative GPA of 2.75 in Towson UTeach courses.

The Physics Secondary Education Concentration requires 128-129 units for completion. Students in this concentration must complete 101-102 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.

Required Physics Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
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<tbody>
<tr>
<td>PHYS 185</td>
<td>INTRODUCTORY HONORS SEMINAR IN PHYSICS</td>
<td>1</td>
</tr>
<tr>
<td>PHYS 241</td>
<td>GENERAL PHYSICS I CALCULUS-BASED</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 242</td>
<td>GENERAL PHYSICS II CALCULUS-BASED</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 243</td>
<td>GENERAL PHYSICS III</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 270</td>
<td>COMPUTERS IN PHYSICS</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 307</td>
<td>INTRODUCTORY MATHEMATICAL PHYSICS</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 311</td>
<td>MODERN PHYSICS I</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 341</td>
<td>INTERMEDIATE PHYSICS LABORATORY I</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 351</td>
<td>MECHANICS</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 354</td>
<td>ELECTRICITY &amp; MAGNETISM</td>
<td>4</td>
</tr>
</tbody>
</table>

Non-Physics Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 273</td>
<td>CALCULUS I</td>
<td>8</td>
</tr>
<tr>
<td>MATH 274</td>
<td>and CALCULUS II</td>
<td>8</td>
</tr>
</tbody>
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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:

<table>
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<td>MATH 273</td>
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<td>8</td>
</tr>
<tr>
<td>MATH 274</td>
<td>and CALCULUS II</td>
<td>8</td>
</tr>
</tbody>
</table>

Total Units: 15-16

Towson UTeach Course Requirements (40 Units)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEMS 110</td>
<td>INTRODUCTION TO STEM TEACHING: INQUIRY</td>
<td>2</td>
</tr>
<tr>
<td>SEMS 120</td>
<td>APPROACHES TO TEACHING</td>
<td>2</td>
</tr>
<tr>
<td>SEMS 130</td>
<td>INTRODUCTION TO STEM TEACHING: INQUIRY-BASED</td>
<td>2</td>
</tr>
</tbody>
</table>

Total Units: 40
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:

NISTA 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.

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.

NISTA 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.
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.

Suggested Four-Year Plan
Freshman
Term 1 | Units Term 2 | Units
-------|-------------|-----
SEMS 110 | 1 SEMS 120 | 1
CHEM 131 | 4 PHYS 241 or 251 | 4
& 131L | | |
MATH 273 | 4 MATH 274 (Core 3) | 4
PHYS 185 | 1 TSEM 102 (Core 1) | 3
ENGL 102 (Core 2) | 3 Core | 3
Core | 3 |
| 16 | 15 |
Sophomore
Term 1 | Units Term 2 | Units
-------|-------------|-----
SEMS 230 | 3 SEMS 240 | 3
PHYS 242 or 252 | 4 PHYS 243 | 4
ASTR 161 | 4 PHYS 270 | 4
Core | 3 PHYS 307 | 3
Core | 3 Core | 3
| 17 | 17 |
Junior
Term 1 | Units Term 2 | Units
-------|-------------|-----
BIOL 200 | 4 SEMS 370 | 3
& 200L | | |
PHYS 311 | 3 PHYS 354 | 4
PHYS 341 | 3 PHYS 385 | 1
SEMS 250 | 3 SCED 461 | 3
SCED 460 | 4 Core | 3
Core | 3 |
| 17 | 17 |
Senior
Term 1 | Units Term 2 | Units
-------|-------------|-----
SEMS 360 (Core 9) | 3 SCIE 393 | 12
SEMS 498 | 3 SCIE 430 | 1
PHYS 351 | 4 |
PHYS Upper-level Elective | 3-4 | |

| | 16-17 | 13 |
Total Units 128-129 |