**ELECTRONIC AND PHOTONIC MATERIALS, MINOR**

Requirements for a minor may be completed at any campus location offering the specified courses for the minor. Students may not change from a campus that offers their major to a campus that does not offer their major for the purpose of completing a minor.

**Program Description**

Electronic and photonic materials have greatly changed modern life. Without them, computers, telecommunication systems, compact disc players, video cameras, and all the electronics with which we have become accustomed would not be possible. The study of electronic and photonic materials is a natural bridge between the fields of electrical engineering and material science. Students in electrical engineering will benefit from this minor because they will better understand the materials with which they will design electronic and photonic devices, such as transistors on a computer chip or semiconductor lasers in a compact disc player. Training in the field of electronic and photonic materials requires study of the processing and characterization of these materials to help engineers develop ways to lower cost and improve performance. This knowledge will help prepare students to enter the semiconductor industry or pursue graduate studies.

**What are Electronic and Photonic Materials?**

Electronic and photonic materials are vital components of future scientific and technological advances. Studying the electronic, photonic, magnetic, and optical properties of materials is vital for building integrated electronic systems for wide ranging applications from computers to cell phones to electronic instruments for medical applications and environmental monitoring. The development of new electronic and photonic materials depends on understanding and controlling the electronic structure of materials and is a natural bridge between the fields of electrical engineering and materials science.

**You Might Like This Program If...**

- You are interested in working in the electronics manufacturing industry.
- You want to know more about what materials are required to power a range of current electronic devices.

**Program Requirements**

**Requirements for the Minor**

A grade of C or better is required for all courses in the minor, as specified by Senate Policy 59-10 (http://senate.psu.edu/policies-and-rules-for-undergraduate-students/59-00-minors-and-certificates/#59-10).

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 112</td>
<td>Chemical Principles II</td>
<td>3</td>
</tr>
<tr>
<td>EE 310</td>
<td>Electronic Circuit I</td>
<td>4</td>
</tr>
<tr>
<td>EE 441</td>
<td>Semiconductor Integrated Circuit Technology</td>
<td>3</td>
</tr>
<tr>
<td>MATH 140</td>
<td>Calculus With Analytic Geometry I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 141</td>
<td>Calculus with Analytic Geometry II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 231</td>
<td>Calculus of Several Variables</td>
<td>2</td>
</tr>
<tr>
<td>MATSE 201</td>
<td>Introduction to Materials Science</td>
<td>3</td>
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</tbody>
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**Prescribed Courses: Require a grade of C or better**

**Additional Courses**

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<tr>
<th>Code</th>
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<tr>
<td>MATSE 450</td>
<td>Synthesis and Processing of Electronic and Photonic Materials or MATSE 455 Properties and Characterization of Electronic and Photonic Materials</td>
<td>3</td>
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Select 3 credits from the following:

- ESC 314 Engineering Applications of Materials

An approved EE course

Select 6 credits from the following:

- EE 442 Solid State Devices
- ESC 445 Semiconductor Optoelectronic Devices
- MATSE 400 Crystal Chemistry
- MATSE 401 Thermodynamics of Materials
- MATSE 402 Materials Process Kinetics
- MATSE 413 Solid-State Materials
- MATSE 417 Electrical and Magnetic Properties
- MATSE 430 Materials Characterization
- MATSE 435 Optical Properties of Materials
- MATSE 450 Synthesis and Processing of Electronic and Photonic Materials
- MATSE 455 Properties and Characterization of Electronic and Photonic Materials

**Academic Advising**

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (http://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy)

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