ELECTROCHEMICAL ENGINEERING, 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
The Electrochemical Engineering minor is designed to equip students with the knowledge necessary to achieve the following educational objectives: become valuable contributors in addressing society's clean energy needs and demands especially in the electrochemical power generation sector; and become educators, practicing engineers, and national leaders in electrochemical energy conversion and storage. The minor integrates skill sets in fundamentals of electrochemistry (e.g., chemistry, physics, mathematics, thermodynamics, and chemical kinetics) and electrochemical engineering applications (batteries, solar, flow and fuel cells, electrochemical synthesis, and corrosion) to ensure successful career opportunities and growth within electrochemical power generation industries, government agencies, and academia. The curriculum should allow students in energy related programs such as chemical, civil, electrical, environmental, mechanical, and materials science and engineering to readily take advantage of the minor and be better prepared for careers in clean power generation and future green technologies.

What is Electrochemical Engineering?
Electrochemistry is the science that focuses on the process of transforming chemical energy into electrical energy. Electrochemical engineers investigate electrochemical energy conversion and storage to create sustainable and alternative energy. They research electrochemistry for applications such as energy storage, power generation, and green energy. Electrochemical engineers seek to improve energy technology within industries, government agencies, and academia.

You Might Like This Program If...
- You are interested in energy-related programs such as chemical, civil, electrical, environmental, mechanical, and materials science and engineering.
- You are interested in pursuing a career in clean power generation and future green technologies.

Program Requirements

Requirements for the Minor
For the minor in Electrochemical Engineering, a minimum of 35 credits is required.

A grade of C or better is required for all courses in the minor, as specified by Senate Policy 59-10 (https://senate.psu.edu/policies-and-rules-for-undergraduate-students/59-00-minors-and-certificates/#59-10). In addition, at least six credits of the minor must be unique from the prescribed courses required by a student’s major(s).

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Requirements for the Minor

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<th>Requirement</th>
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<tr>
<td>Requirements for the Minor</td>
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Code   Title                                                                 | Credits |
---     |---------|---------|
CHE 112 Chemical Principles I                                               | 3       |
EGEE 441 Electrochemical Engineering Fundamentals                            | 3       |
ESC 455 Electrochemical Methods Engineering and Corrosion Science            | 3       |
MATH 251 Ordinary and Partial Differential Equations                          | 4       |
MATSE 421 Corrosion Engineering                                               | 3       |
PHYS 212 General Physics: Electricity and Magnetism                           | 4       |

Prescribed Courses

Prescribed Courses: Require a grade of C or better

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EGEE 441 Electrochemical Engineering Fundamentals                            | 3       |
ESC 455 Electrochemical Methods Engineering and Corrosion Science            | 3       |
MATH 251 Ordinary and Partial Differential Equations                          | 4       |
MATSE 421 Corrosion Engineering                                               | 3       |
PHYS 212 General Physics: Electricity and Magnetism                           | 4       |

Additional Courses

Additional Courses: Require a grade of C or better

Select 6 credits of the following:

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CHE 330 Process Fluid Mechanics                                              | 6       |
or ME 300 Engineering Thermodynamics I                                        |         |
EME 301 Thermodynamics in Energy and Mineral Engineering                     |         |
EME 303 Fluid Mechanics in Energy and Mineral Engineering                    |         |
or CHE 220 Introduction to Chemical Engineering Thermodynamics              |         |
MATSE 402 Materials Process Kinetics                                         |         |
ME 320 Fluid Flow                                                           |         |
or MATSE 4Thermodynamics of Materials                                        |         |

Select 9 credits of the following:

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EGEE 420 Hydrogen and Fuel Cells                                             |         |
EGEE 436 Modern Thermodynamics for Energy Systems                            |         |
EGEE 437 Design of Solar Energy Conversion Systems                           |         |
EME 407 Electrochemical Energy Storage                                       |         |
ME 403 Polymer Electrolyte Fuel Cell Engines                                 |         |

Student Outcomes
The integration of knowledge and skills acquired through the inquiry-based teaching methods should enable students of the program to achieve the following student educational outcomes:

- solve problems relating to the production, storage, distribution and utilization of electrochemical energy and the associated environmental issues
- design and conduct experiments, acquire data, define, analyze, and interpret data, and solve practical, complex problems on a variety of electrochemical technologies such as batteries, solar cells, flow and fuel cells, electrolyzers, and supercapacitors
- integrate professional, ethical, social and environmental factors in electrochemical engineering design and problem solving and understand the impact of these factors on global energy issues
- develop the ability to communicate effectively in writing and orally and build teamwork
- acquire the desire for lifelong learning to maintain technical competence and keep abreast of new developments in the field.

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
Electrochemical Engineering, Minor

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 (https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/)

University Park

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