# MECH3110: Materials for Energy Technologies

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| **Course Code:** MECH3110 | **Course Title:** Materials for Energy Technologies |
| **Required Course Or Elective Course:** Energy/Materials Option Elective | **Terms Offered (Credits):** Fall or Spring (3 credits) |
| **Faculty In Charge:** Qing Chen | **Pre/Co-Requisites:** None |
| **Course Structure:** 2 hours and 40 mins lecture and 1 hour tutorial | |
| **Textbook/Required Material:**<br>Lecture notes | |

**Bulletin Course Description:**

1. This course aims to equip students with the knowledge on how materials are selected, designed, and manufactured for various energy technologies. We will provide the students a broad perspective of the roles of materials in addressing the current and emerging energy challenges. The course will promote the communications among students of various backgrounds in the MAE department or even across departments, and inspire their learning and research interests in interdisciplinary fields.
2. The course will first lay down the background knowledge of materials science, which is built upon entry-level chemistry and physics. This knowledge of materials science will be carried on throughout the course as the rationale for materials selection and engineering.
3. The course will involve light calculations to deepen students' understanding of challenges and materials requirements in current energy technologies. We will also arrange lab visits to inspire their interests in energy materials research.

**Course Topics:**

1. Introduction
2. Materials Science Basics
3. Fossil fuels
4. Nuclear energy and radio-resistive materials
5. Wind energy and composite materials
6. Solar energy and semiconductors
7. Intermittency and electricity storage
8. Batteries and electrode materials
9. Lithium-ion batteries and intercalation electrodes
10. Fuel cells and catalysts
11. Supercapacitor
12. Materials cost and abundance

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| **Course Objectives:** | 1. To provide the knowledge of material structure-property correlations utilized in energy technologies<br>2. To teach operating principles of advanced energy devices<br>3. To help student understand critical material challenges facing the adoption of renewable energy sources |
| **Course Outcomes:** | 1. The students will grasp the basic knowledge of materials science and its use in energy technologies<br>2. The students will be able to use material properties to estimate |

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| | the critical performance metrics of energy devices<br>3. The students will better understand the critical energy challenges facing mankind and the role of materials in addressing the challenges |
| **Assessment Tools:** | Homework (30%)<br>Exam (40%)<br>Project report (30%) |