



# Materials for Energy Technology

## MATSCEN 5572

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**Credit Hours:**

3.00

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**Course Levels:**

Undergraduate (1000-5000 level)

Graduate (5000-8000 level)

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**Course Components:**

Lecture

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**Course Description:**

Structure property relationships of materials in energy applications. Photovoltaic materials, solid state photonic materials, electrochemical devices such as batteries, fuel cells and chemical sensors, superconductors, memory and nuclear materials.

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**Prerequisites and Co-requisites:**

Prereq: 2241, and 3271 or ECE 2300; and enrollment as MatScEn-BS major; or Grad standing; or permission of instructor.

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**Course Goals / Objectives:**

- Introduce students to structure property relationships of materials in energy applications.
- Introduce students to the technology and materials involved in photovoltaics. Understand structure property relationships in processing and synthesis of these materials. Understand degradation related to applications.
- Introduce students to materials for solid state lighting. Understand structure property relationships in processing and synthesis of these materials. Understand degradation related to applications.
- Introduce students to electrochemical devices and materials: batteries, fuel cells and chemical sensors. Understand structure property relationships in processing and synthesis of these materials. Understand degradation related to applications.
- Introduce students to high-TC superconductor materials and their application for energy efficient technology.
- Introduce students to memory materials: ferromagnets, phase change materials and spintronics for low power switching devices. Understand degradation related to applications.
- Introduce students to materials for nuclear energy production. Understand structure property relationships in processing and synthesis of these materials. Understand degradation related to applications.

**Course Topics:**

- Introduction to photovoltaic (solar cell) materials
  - Wide Band Gap Materials for energy efficient photonics
  - Basics of electrochemical devices [including point defects and ionic conductivity]
  - Battery Materials
  - Fuel Cell Materials
  - Chemical sensors
  - Superconductors for Energy Transmission [efficient transformers]
  - Memory Materials for Energy: Ferromagnets for efficient generators and transformers, phase change materials and spintronics for low power switching devices.
  - Nuclear Materials
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**Designation:**

Elective