THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Materials for Energy Technology

MATSCEN 5572

Credit Hours:
3.00

Course Levels:
Undergraduate (1000-5000 level)
Graduate (5000-8000 level)

Course Components:
Lecture

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.

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

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

Designation:

Elective