



**THE OHIO STATE UNIVERSITY**  
COLLEGE OF ENGINEERING

# Advanced Topics in Solar Energy Systems

## MECHENG 5535

**Credit Hours:**

3.00 - 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:**

The broad course objective is to understand the design, manufacturing, operations and financing of solar energy plants, systems utilizing classroom lecture and presentation, computer simulation, and two projects.

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**Prerequisites and Co-requisites:**

Prereq: Jr, Sr, or Grad standing in MechEng, AeroEng, NuclrEn, ECE, CSE, CivilEn, or ISE; or permission of instructor.

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**Course Goals / Objectives:**

- Understand physics of solar energy how solar insolation converts through the photo-voltaic process to energy. Understand spherical geometry and how the sun inclination, location, affects the energy output of a power plant.
  - Obtain overview of the components of a solar energy systems and utility plants. Obtain a comprehensive understanding of the technology and design process. Understand frontiers of new R&D in solar photo-voltaic for buildings and vehicles.
  - Obtain an overview of global aspects of solar energy, the economics of solar energy and an appreciation of financing aspects.
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**Course Topics:**

- Global installations and components, including energy trends, tariffs, types of modules, size of plants, and usage of trackers
  - Photo-voltaic Theory and constituents of a solar module and its manufacture, including materials and their characteristics
  - Modules used in industrial power plants including new and advanced efficiency modules
  - Inverters, DC and AC usage and using solar in conjunction with battery storage, and grid connectivity
  - Solar power plant design, including solar resource over the year, geometry, component selection, estimation of power outputs and losses, structures, trackers, and data acquisition SCADA systems
  - Use of design software - PVsyst universally used.
  - Operational issues and performance. Review of power plant data
  - Economics and project financing, including XL-based build of financial model, trade-offs between tariffs and returns, and servicing metrics
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**Designation:**

Elective