ME 555 Thin-Film PV:

**Course Goals:**

Explore the science and technology of solar energy conversion, with a goal of incorporating cutting-edge trends in the field. Using thin-film PV devices as an example, provide a combination of theoretical and hands-on experiences, giving the student a sense of approaches more generally applicable in contemporary PV device research.

**Topics Covered:**

1. Basics: Review of fundamentals of photovoltaic energy conversion
2. Thin-film solar cell designs
3. Important parameters governing solar cell performance
4. Materials science of thin-film solar cell materials
5. Characterization tools for solar cells and materials
6. Simulation software for modeling solar cell operation
7. Lab techniques for making thin-film solar cells

**Grading:**  *Simple math / counting points...*

- **Homework:** 25% (article readings/computer modeling/problems)
- **Device project:** 25% (1 lab project/report/presentation/participation)
- **Advanced topic presentation:** 25% (1 reading/presentation/participation)
- **Midterm(s):** 25%
Typical Syllabus:

Week 1  – Review thin-film PV (Basics and semiconductor physics)
Week 2  – Review thin-film PV (p-n junctions under dark and light conditions)
Week 3  – Recombination and loss mechanisms
Week 4  – Basic measurement techniques and summary of thin film PV types
Feb 13  – Midterm I (on device physics)
Week 5  – Detailed look at CdTe/CIGS
Week 6  – PV Device modeling
Week 7  – Detailed look at perovskite PV
Week 8  – Intro to lab and discussion of special projects
Week 9  – Lab project (approx. March 6 – 20)
Week 10 – Lab project (approx. March 6 – 20)
Week 11 – Presentation of lab results + CZTS and “earth abundant”
Week 12 – Amorphous Si and organic PV (lab reports due)
Week 13 – Student presentations on advanced topic (30/5 min each)
Week 14 – Student presentations on advanced topic (30/5 min each)
April 15 – Class Review
April 17 – Midterm II (primarily on technologies) -- Also, last day of classes