# SAMPLE SYLLABUS

This syllabus is to be used as a guideline only. The information provided is a summary of topics to be covered in the class. Information contained in this document such as assignments, grading scales, due dates, office hours, required books and materials may be from a previous semester and are subject to change. Please refer to your instructor for the most recent version of the syllabus.

# ABET Course Syllabus EEE465

1. **Course: EEE 465 Photovoltaic Energy Conversion**
2. **Credits and Contact Hours:** 3 Credit Hours (lecture), Topics: Engineering
3. **Course Coordinators:** Dr. Christiana Honsberg, Professor, Dr. Michael Goryll, Associate Professor
4. **Textbook:** On-line textbook, found at: http://pveducation.org/
   - **Supplemental materials:** Stuart R Wenham, Martin A Green, Muriel E Watt, Richard Corkish and Alistair Sproul, *"Applied Photovoltaics"*, 3rd ed. London; New York: Earthscan, 2012. ISBN-13: 978-1849711425. It is available in electronic format via the ASU library webpage **https://ebookcentral-proquest-com.ezproxy1.lib.asu.edu/lib/asulib-ebooks/detail.action?pq-origsite=primo&docID=1112446**
5. **Specific course information**
   a. **Catalog description:** This course will introduce you to the physics and engineering of photovoltaic energy conversion. While the focus will be on photovoltaic devices, we will also cover the basics of radiation, the thermodynamic limits of energy conversion, grid-tied photovoltaic systems, and sustainability and economics. The emphasis of the course will be on conceptual understanding and order of-magnitude calculations rather than memorization of equations; we will consider the course a success if you can explain to your mother why she should or should not install photovoltaic modules on her roof, what kind of modules she should use, and why they are only 10–20% efficient.
   b. **Prerequisites or co-requisites:** EEE 352 or Familiarity with basic semiconductors.
   c. **Required/elective/selected elective:** Elective

6. **Specific goals for the course**
   Students will be able to analyze and design standalone photovoltaic systems
   a. **Outcomes of instruction:**
      - Calculate and convert between the properties of a light source, including energy, wavelength, spectral irradiance, and photon flux.
      - Calculate the power incident on a surface from solar radiation.
      - Calculate solar cell efficiency from a device structure.
      - Design a solar cell given technological and material constraints.
      - Identify key solar cell commercial technologies.
      - Identify factors that affect PV module performance comparted to solar cell performance.
      - Identify key components of a PV system.
      - Calculate basic lifecycle cost of energy of a PV system.
      - Demonstrate ability to find information on how solar cell and PV systems performance and cost is relevant to broader photovoltaic community
   b. **Outcomes of Criterion 3 addressed by the course:**
      **(1)** Students will be introduced to the physics of PV systems. They will apply mathematical and scientific principles to the understanding of PV system components, their design and operation.

**(2)** Students will design components and complete PV systems, based on customer specifications and environmental constraints.
**(3)** Students will prepare a conference-style presentation of their final project.
**(4)** Students will work on engineering problems with high economic and environmental significance.
**(5)** Students will work with location data and use their enmgineering jusdement to design PV systems.
**(6)** Students will acquire programming knowledge during the projects to interpret and vizualize data.

7. **Brief list of topics to be covered**
    - Present State of Photovoltaics: Technology, Market, and Impact
    - Basics of Solar Radiation
    - Operation of Solar Cells: Semiconductor Basics: Solar Cell Basics; Solar Cells structures; Non-Idealities: Solar Cell Efficiency and design
    - Solar Cell Technologies: Silicon; Thin Film; III-V; Emerging Materials
    - PV System Components: PV modules, power conditioning, balance of system.
    - PV Systems: Application, Economics, Design and Critical Issues

**Computer Usage:** Modern computational tools (MATLAB or Python) are used for the analysis and necessary calculations of the homework assignments and the projects.

**Laboratory Experiments:** None.

**Course Contribution to Engineering Science and Design:** Students have to solve design and operation problems in homeworks and projects.

Person preparing this description and date of preparation: M. Goryll, June, 2021.