

Transforming Solar Power to Usable Energy
Summer, 2021
July 12-15, 10 am – 12 pm and 1 pm – 3 pm, Distance Education

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Course Description: In the summer mini course, the basic operation principle of solar power system is introduced. Topics include properties of sunlight, semiconductor, P-N junction, photovoltaic effect, I-V characteristics, maximum power point tracking, interconnection, and battery storage. Three hands-on labs are included to help students better understand the angle effect, interconnection, spectral response, and maximum power point tracking.

Mode of Instruction: Synchronously online delivery via Zoom (access through Canvas – *Zoom* tab) with asynchronous video recording (access through Canvas – *Panopto Recordings* tab) for later review.

Course Learning Outcomes:

After completion of this course, students are expected to be able to:

- Understand the properties of sunlight, such as spectral content of incident light, radiant power density from the sun, and the impact of incident angle.
- Understand the operation principles of solar cells, such as conduction in semiconductor, formation of P-N junction, photovoltaic effect, and I-V curve of photodiode.
- Understand the challenges of solar cell based power system, such as interconnection effect, battery storage, lifetime, and maintenance.
- Optimize the power generation of solar cell based on I-V characteristics.
- Design and implement a small scale solar power system.

Course schedule

Date	Time	Topic
July 12	10 am - 12 pm	Course navigation, Li-Fi research presentation.
July 12	1 pm - 3 pm	Properties of sunlight, semiconductor, P-N junction.
July 13	10 am - 12 pm	Photovoltaic effect, I-V characteristics.
July 13	1 pm - 3 pm	Lab: assembling solar power station and testing angle effects.
July 14	10 am - 12 pm	Maximum power point tracking, interconnection, battery storage.
July 14	1 pm - 3 pm	Lab: interconnection and spectral response of solar cells.
July 15	10 am - 12 pm	Lab: maximum power point tracking.
July 15	1 pm - 3 pm	Student presentation and open discussion of lab results.

Grading: Submission of the final lab report is the minimum requirement of passing the course.