

Engineering Problem Solving

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Author Information

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Course Details

Description

There are three goals for this curriculum:

- Sustainability focused lab exercises
- Hands-on experience
- Project-based learning

Students who enrolled in the course will learn MATLAB through solving sustainable/renewable engineering related problems. Students will also gain hands-on experience working with hardware (developed based on Arduino UNO) to gather sunlight data. The course emphasizes topics in solar cell technology, but other topics such as green building design and electric vehicles are also briefly covered.

This course targets lower division undergraduate students (however, some senior students also enroll) in all engineering and scientific disciplines. The pre-requisite for the course is only differential and integral calculus. No computer science (programming) courses are required.

Important: Although students are introduced to various topics in sustainable engineering, the goal of the course is to teach engineering problem solving (and how to use MATLAB to model and solve engineering problems) and not sustainable engineering.

Original Course Documents

[Source file URL](#)

Course Contents

Lectures

- [Sustainable Engineering Lecture](#)
- [Introductory Slides on MATLAB I/O](#)

Lab 1

- [One Dimensional Vectors Lab](#)
- [Solutions](#)

- Accompanying Files
 - [data.xlsx](#)

Lab 2

- [Two Dimensional Vectors Lab](#)
- [Solutions](#)
- Accompanying Files:
 - [afv.mat](#)
 - [afv.xls](#)
 - [Davis Weather 7012010 6302011.csv](#)
 - [hev.mat](#)
 - [hev.xls](#)
 - [SAC AP 2005 solar.csv](#)
 - [work.mat](#)
 - [work.xls](#)

Lab 3

- [Logical Operations, Flow Control, and Loops Lab](#)
- [Solutions](#)
- Accompanying Files:
 - [illum.mat](#)
 - [mppt_load.xlsx](#)
 - [myload.xlsx](#)
 - [panel_mpp.m](#)
 - [pd_mpp.asv](#)
 - [pd_mpp.m](#)
 - [Q8_soln.m](#)

Lab 4

- [Custom Functions Lab](#)
- [Solutions](#)
- Accompanying Files:
 - [q5.mat](#)
 - [lab6.mat](#)
 - [myadd.m](#)
 - [myNewton.m](#)
 - [solar_panel_optimal.asv](#)
 - [solar_panel_optimal.m](#)
 - [solar_panel.m](#)

Projects

Project 1

- [Project 1 from Winter 2012](#) -- Not open ended. Specific tasks for students to complete. This version does not use all data from the weather database below).

- [Sample Solution](#)
- Accompanying Files:
 - [weather.mat](#) or [weather.xlsx](#) (contains solar, wind, precipitation, land area, and population data for 54 cities)
 - [PartUSA.tif](#)

Project 2

- [Project 2 from Winter 2012](#) -- Five open ended topics. Topics 1 - 3 are renewable energy related, 4 and 5 are not.
- [Project 2 from Summer 2011](#)
 - Accompanying Files:
 - [StatesInfoMatFile.mat](#)
 - [CitiesMatFile.mat](#)

Solar Module

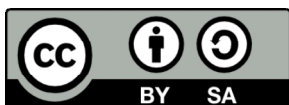
- [Solar Module documentation web page](#)
- [Solar Panel Characterization web page](#)
- [Solar Cell Characterization Lab Description](#)
- Accompanying Files:
 - [HW7.pdf](#)
 - [ard_sweep.m](#)
 - [arduino.m](#)
 - [SAMPLE_sweep.m](#)
 - [load_sweep.xls](#)
 - [PV_data_7days.xls](#)
 - [Lab7_solution](#)
 - [Solar Cell Char soln](#)

Resources

- [American Society for Engineering Education \(ASEE\) Lecture](#)
- [ASEE Paper](#)
- [Poster](#)

Links

- [About the course](#)
- [People](#)
- [Future Work](#)
- [Acknowledgements](#)



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