

EE 1703: Laboratory for Energy, Environment and Society

Lab Syllabus (1 credits)

Prerequisites: EE1701 (prior or concurrent registration)

Course Schedule:

Starting in Spring, 2018: 2 hour lab per week

Course Instructor:

Ned Mohan, Professor (www.ece.umn.edu/~mohan)

Department of Electrical and Computer Engineering

Phone: 612-625-3362, Email: mohan@umn.edu

Instructor Contact Information:

Please email the instructor and the TAs for any questions or comments and your email will be responded within 24 hours.

Required readings:

There will be pre-lab reading/homework for each of the experiments.

Software Requirements:

Access to moodle and the internet for further inquiry on each topic for the latest developments.

Lab Objectives:

This lab is to complement what students are learning in the associated three-credit course EE1701. This lecture course was started in Spring 2017 with a registration of 53 students. It's being taught again and 97 students are registered. Also, through our university's College in the Schools (CIS) program, it's being taught in three Saint Paul high schools. There are nearly 500 high schools in Minnesota and therefore the potential is huge. The faculty coordinator for this CIS course is Professor Bill Robbins.

EE1701 meets the LE Theme of "Technology and Society." If we are allowed to offer the associated lab EE1703, then we will request that both, EE1701 and EE1703, be granted the "Physical Science" core that will encourage many more students to take it. I am in touch with Prof. Tom Shield of the CSE Curriculum Committee and Prof. Ken Leopold who is on the university-level committee that decides on LE themes and the cores such the Physical Science core.

EE1701 has a course website (<http://z.umn.edu/ee1701>) that has the syllabus and the course learning outcomes. The course learning outcomes of the proposed lab EE1703 will be similar: to recognize that the climate is dramatically changing because of us, the consequences are unimaginable – a sixth mass extinction - and the end of all life as we know it, and the time to act

is *now*, based on the plentiful resources like solar and wind and through the technologies that we I already have.

In this respect, this course challenges our moral and ethical responsibility since it's our actions that are responsible for this genocide in the making, with billions of the poorest of the poor on the frontline.

Experiments:

1. Demonstration of Global Warming by CO₂
2. Characteristics of Light for Power Generation through PVs, Lighting through LEDs, and Growing Plants in Greenhouses – to be developed with the help of Prof. Jim Leger
3. Energy Generation Using PV Panels and the Maximum Power Point
4. PV Panels in Series and Parallel combinations
5. Wind Turbine Characteristics and the Maximum Coefficient of Performance
6. Wind Turbine Characteristics for varying wind speeds and Pitch Control of Blades
7. Showing Battery Characteristics
8. AC Electric Systems: Real and Reactive Power, 1-Phase
9. Three-Phase Systems, Motors and Generators
10. LEDs compared to Incandescent Lamps and CFL
11. Growing Plants using LEDs and batteries in Greenhouses
12. Air Conditioning and Heat Pumps
13. Simulation of various energy resources to meet the load demand on the electric grid
14. Economic Calculations of using an Electric Vehicle and Participating in Community Solar Gardens

This is a work in progress and we will be ready with 5 experiment setups by the Spring 2018 to offer this laboratory course to a limited number of students in this first offering.