ENMA 412: Fundamentals of Solar Cells

Course Description: Overview of the fundamentals of photovoltaic devices, including principles of operation, with emphasis on the materials science aspects of the different technologies available.

Pre-requisites: ENMA 300 or consent of instructor

Textbook: TBD

Course Objectives: The objective of this class is to understand the fundamentals of photovoltaic devices including the different technologies available.

Topics Covered:

The photovoltaic effect
Schokley-Queisser limit, Photon in, electrons out
Characteristics of a solar cell, figures of merit
Solar radiation
Electrons and holes in semiconductors
P-n junctions
Generation and recombination (transport in semiconductors)
Solar cell operation
Solar cell design (introduction to simulation)
PV technologies: Monocrystalline solar cells, III-V, III-nitrides, Thin-films a-Si, CdTe, CIGS, Light trapping
Third generation concepts:multijunctions, intermediate band, multi-exciton generation, up/down conversion, hot-carrier cells
Organic PV
Characterization: IV, electrical measurements, optical, lifetime, luminescence measurements
Modules and arrays

Class Schedule: Monday, Wednesday 3:30-4:45 pm

Grading:

Midterm: 25%
Homework: 20%
Term Paper: 25%
Final Examination: 30%

Academic Integrity: http://www.shc.umd.edu/

Course Website: https://umd.instructure.com/ (ENMA 412)

Google Doc guide to Canvas: http://ter.ps/engrcanvas

Instructor: Dr. Marina Leite email: mleite@umd.edu

Tel: 301-405-0231
Office hours (tentative): Tues. 3:30-5 pm, Weds. 1-2 pm and by appointment

Attendance Policy: Regular attendance and participation in this class is the best way to grasp the concepts and principles being discussed. However, in the event that a class must be missed due to an illness, the policy in this class is as follows:

1. For every medically necessary absence from class, a reasonable effort should be made to notify the instructor in advance of the class. When returning to class, students must bring a note identifying the date of and reason for the absence, and acknowledging that the information in the note is accurate.

2. If a student is absent for more than three classes, the instructor may require documentation signed by a health care professional.

3. If a student is absent on days when tests or presentations are scheduled, he or she is required to notify the instructor in advance, and upon returning to class, bring documentation of the illness, signed by a health care professional.

CourseEvalUM: Your participation in the evaluation of courses through CourseEvalUM is a responsibility you hold as a student member of our academic community. Your feedback is confidential and important to the improvement of teaching and learning at the University as well as to the tenure and promotion process. CourseEvalUM will be open for you to complete your evaluations for semester courses sometime in December. Please go directly to the website (www.courseevalum.umd.edu) to complete your evaluations. By completing all of your evaluations each semester, you will have the privilege of accessing online, at Testudo, the evaluation reports for the thousands of courses for which 70% or more students submitted their evaluations.

Relationship of the class to the program objectives. This course is an elective course. It teaches students the basic information that they will need to understand photovoltaics.

Counseling Center/Learning Assistance Service
"If you are experiencing difficulties in keeping up with the academic demands of this course, contact the Learning Assistance Service, 2202 Shoemaker Building, 301-314-7693. Their educational counselors can help with time management, reading, math learning skills, note-taking and exam preparation skills. All their services are free to UM students." http://www.counseling.umd.edu/