New Special Topics Graduate Materials Science & Engineering/Special Topics in Electrical Engineering

This course provides a graduate level introduction to solar photovoltaic materials, the device physics of photovoltaic cells, and practical solar electric systems engineering applications. First this course will focus on semiconductor materials for photovoltaic devices, including effects of microstructure, band theory, optoelectronics, and charge transport. Then the device physics of solar photovoltaic cells will be reviewed including semiconductor junctions, principles of operation, structures, fabrication, and manufacturing of conventional, thin film, dye sensitized, and other “3rd generation” solar cells. Finally solar photovoltaic systems engineering will be covered in detail - including topics of: the solar resource, systems modeling/software, power conditioning equipment and system integration techniques, mechanical elements (frames, supports, orientation mechanisms, and tracking), and energy storage. Finally, solar energy systems engineering economics will be reviewed along with solar energy policy including implications of high solar penetration levels and a shift to distributed generation.

The course is meant for graduate students in Materials Science & Engineering, and Electrical & Computer Engineering, while graduate students in other areas of engineering or physics with a strong interest in this topic are also welcomed.

The final grade will be made up of 50% homework assignments and 50% final project.

Prerequisite: Permission of the instructor.

Instructor: J. M. Pearce (pearce@mtu.edu)