Course Description:
In this course we will study optoelectronic fundamentals and devices. Topics include, the nature of light and sunlight, review of PN junctions, solar cells fundamentals, light emitting diodes (LEDS), and basics of lasers. Some time will be devoted to understanding and reviewing optical and semiconductor fundamentals. For example how light interacts with matter, especially electrons. We will also review how PN junctions function since they important to device operation. Finally we will look at several optoelectronic devices including solar cells, LEDS and lasers. We will cover photodetectors is time permits. We will study solar cells in significant detail. Specifically we will discuss the state-of-the-art in thin-film solar cells. For example, we will study CdS/CdTe polycrystalline solar cells in great detail. Polycrystalline devices are more challenging to understanding their behavior compared to single crystal devices due to granular nature of the material. Heterostructures with a large lattice mismatch such as the CdS/CdTe system are also more challenging due to the defects created at the interface. Therefore, CdS/CdTe solar cells will add a new dimension to the study of optoelectronic devices. In addition to single crystal semiconductor fundamentals, surface effects at grain boundaries and the effect of defects at the interface will be very important.

Topics
Nature of light and sunlight
Review of PN junctions
Solar cells fundamentals
Light emitting diodes (LEDS)
Basics of laser operation
Photodetectors (if time permits)

Learning Objectives:
After completion of this course, students should be able to:
• Understand and apply semiconductor fundamentals to the analysis of optoelectronics devices.
• Understand the physics of optoelectronics devices.
• Understand the nonideal effects that polycrystalline devices exhibit.
• Understand the state-of-the-art on CdS/CdTe solar cells.
Required Textbook:
Online book: http://www.pveducation.org/pvcdrom

Reference Texts:
The Physics of Semiconductors with Applications to Optoelectronic Devices, Brennan, 1999, Cambridge University Press

Evaluation:

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<td>Problems</td>
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<td>Final Exam</td>
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Grading and Policies:
A: 90%-100% B: 80%-<90% C: 70%-<80% D: 60%-<70% F: 0-<60%
Late course work will not be accepted.
No make-up work will be given.

If you have a disability and need classroom accommodations, please contact The Center for Accommodations and Support Services (CASS) at 747-5148, or by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at www.sa.utep.edu/cass.