

OSE 4410: Optoelectronics

COURSE SYLLABUS

Instructor: Dr. Mercedeh Khajavikhan

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Office Hours: Mondays 2- 3 pm, and by appointment

Term: Spring 2019

Class Meeting Days: **Tuesdays-Thursdays**

Class Meeting Time: **3:00 pm- 4:15 pm**

Class Location: **CREOL A214**

I. **University Course Catalog Description**

Introduction to the principles and design of semiconductor optoelectronic devices including photodiodes, solar cells, light-emitting diodes, laser diodes, and CCDs. Applications include photovoltaics, displays, photodetection, and optical communications.

II. **Course Overview**

This course is an introduction to the principles, design, and applications of optoelectronic devices. The course begins with a description of the interaction of light with semiconductor materials in a p-n junction configuration. This includes the phenomena of absorption, electroluminescence, and stimulated emission. The distinction between direct and indirect compound semiconductor materials is noted. Basic devices are then described: photodiodes, light emitting diodes (LEDs), semiconductor optical amplifiers, and laser diodes are then described. Array detectors, including complementary metal-oxide-semiconductor (CMOS) and charge-coupled devices (CCD) arrays, and array LEDs are then introduced. Basic specifications and applications of each of these devices are described, including solar cells, imaging with array detectors, and LED displays.

III. **Course Learning Objectives**

Upon completing this course, the students will:

State the various kinds of semiconductor materials used in optoelectronics

Explain the mechanisms of light absorption and emission in p-n junctions

State the most common specifications of photodiodes, LEDs, and laser diodes and their basic design

Describe common designs of array detectors and LED arrays.

Distinguish between LCD and LED TVs, based material learned in this course and in OSE 3052 (Introduction to Photonics)

IV. **Course Prerequisites**

EEE 3307C Electronics I, OSE 3052 Introduction to Photonics

V. **Credits**

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VI. Course Texts

Optoelectronics and Photonics principles and practices, Second Edition S.O.Kasap
Solid State Electronic Devices (6th Edition), Ben Streetman , Sanjay Banerjee

VII. Course Requirements

The student is expected to review the textbooks; and come to class prepared.
The student is expected to return the homework on time and participate in class discussions.

VIII. Course Grading

Course Item	Percent of Final
Class Participation	5%
Quizzes	5%
Homework	20%
Midterm/Midterms	30%
Final Exam	40%
	100%

IX. Grading Objections

All objections to grades should be made IN WRITING WITHIN ONE WEEK of the work in question. Objections made after this period has elapsed will NOT be considered – NO EXCEPTIONS.

X. Professionalism and Ethics

It is the nature of a laboratory course that you will be working in groups. Obviously, those of you who are lab partners will be using the same raw data. You are encouraged to discuss your observations and insights with your lab partners; however, each of you has to write your own ORIGINAL lab reports.

Academic dishonesty in any form will not be tolerated. If you are uncertain as to what constitutes academic dishonesty, please consult The Golden Rule, the University of Central Florida's Student Handbook (<http://www.goldenrule.sdes.ucf.edu/>) for further details. As in all University courses, The Golden Rule Rules of Conduct will be applied. Violations of these rules will result in a record of the infraction being placed in your file and the student receiving a zero on the work in question AT A MINIMUM. At the instructor's discretion, you may also receive a failing grade for the course. Confirmation of such incidents can also result in expulsion from the University.

Definitions

Cheating: any unauthorized assistance in graded, for-credit assignments.

Plagiarism: appropriating the work of others and claiming, implicitly or explicitly, intentionally or unintentionally, that it is your own.

With increased use of the internet, digital plagiarism is becoming more of a problem on campuses everywhere. You are encouraged to use the internet; however, electronic copying and pasting of material directly into reports and papers without proper reference of the source is blatant plagiarism. Always reference the sources of information.

Providing a fellow student with experimental data from an experiment in which he/she did not participate is also forbidden. All parties that are involved in such practice will be reported to UCF Office of Student Conduct (OSC).

If there is any question concerning acceptable practice in this laboratory course, don't hesitate to ask the instructor.

XI. Students with Special Testing/Learning Needs

Students with special needs and require special accommodations must be registered with UCF Student Disability Services prior to receiving those accommodations. Students must have documented disabilities requiring the special accommodations and must meet with the instructor to discuss the special needs as early as possible in the first week of classes. UCF Student Disability Services can be contacted at <http://www.sds.sdes.ucf.edu/>, or at (407)823-2371.

XII. Excusal from Course Assignments and Course Examinations

If an emergency arises and a student cannot submit assigned work on or before the scheduled due date or cannot take an exam on the scheduled date, the student MUST give notification to the instructor NO LESS THAN 24 HOURS BEFORE the scheduled date and NO MORE THAN 48 HOURS AFTER the scheduled date.

XIII. Class Attendance and Participation

Regular class attendance is mandatory.

Please be on time to class.

Students in attendance are expected to be active participants in the course.

Note: The instructor reserves the right to modify the information contained in this document at his discretion.

Course Schedule:

Jan 8-22	Introduction and Physics of Semiconductors- Chapter 3
Jan 24-Feb 7	pn Junctions- chapter 3
Feb 12- Feb 14	LED- chapter 3
Feb 19-March 5	Laser- Chapter 4
March 7	Midterm
March 19- April 2	Photodiode-Chapter 5
April 4- April 9	Noise- Chapter 5
April 11-18	Photovoltaics- Chapter 6

Final Exam: Wednesday, Thursday April 25th, 2019 1:00 PM – 3:50 PM

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