



CREOL, The College of Optics and Photonics

OSE 4410: Optoelectronics
CREOL, The College of Optics and Photonics
Credit Hours: 3
Term: Spring 2024

Syllabus

Time:	Tuesdays & Thursdays, 1:30 PM – 2:45 PM, January 8 – April 18
Location:	BA1 O218
Prerequisites:	EEE 3350 Semiconductor Devices, OSE 3052 Introduction to Photonics.
Course 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.
Instructor:	Patrick LiKamWa
Email/Contact Info:	patrick@creol.ucf.edu
Office Hours and Location:	by appointment either in person in rm-209 or via ZOOM
Course Modality:	P (face to face)
GTAs:	Musharrat Shabnam mshabnam@knights.ucf.edu
Class Website/ Webcourse	https://webcourses.ucf.edu/courses/1421517

Course Materials:

Textbook: Optoelectronics and Photonics - Principles and Practices, Second Edition S.O. Kasap

Reference (Optional) Books:

- Solid State Electronic Devices (6th Edition), Ben Streetman, Sanjay Banerjee
- Optoelectronic Devices, Niloy K Dutta, Xiang Zhang, World Scientific Publishing Company, 2018.
- Physics of Semiconductor Devices, Simon M. Sze, Kwok K. Ng, Wiley, 2006

Course Grading and Requirements for Success:

- The student is expected to review the textbook, notes, and other materials before class.
- You are required to attend class

Homework:	10%
Exams:	65%
Quizzes:	20%
Attendance:	5%
Final Exam:	Tuesday, April 30, 2024 (1:00 PM - 3:50 PM)

Make Up Policy: 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.

Attendance Policy: Attendance will be taken using “UCF Here” app.

Please download the app at <https://ucfmobile.ucf.edu/apps/#ucf-here>

- More than 5 unexcused absences will result in a loss of 5% of total grades

If an absence is recorded due to the UCF Here app not working, it is the responsibility of the student to send an email to the instructor as soon as possible after class.

All other Excused Absences should be communicated as soon as possible via email or at the next class meeting.

Criteria	Grade Weighting
Homework	10%
Quizzes	20%
Participation/Attendance	5%
Midterm Exam-1	15%
Midterm Exam-2	20%
Final Exam	30%
Total	100%

Assignment Submission:

- Quizzes will be administered using Lockdown Browser through Webcourses@UCF
- Homework Assignments will be posted on Webcourses and submissions must be uploaded on Webcourses before the assigned deadline.
- The homework submissions must be in the student’s own handwriting, neatly presented and showing all the steps in arriving at the solutions. They must be in either pdf-format (preferred) or jpg format.

Financial Aid and Attendance: As of Fall 2014, all faculty members are required to document students' academic activity at the beginning of each course. In order to document that you began this course, please complete the following academic activity by the end of the first week of classes, or as soon as possible after adding the course, but no later than January 13th. Failure to do so will result in a delay in the disbursement of your financial aid.

Grading Scale (%)	Rubric Description
100 ≥ A > 93 ≥ A ⁻ > 90	Excellent, has a strong understanding of all concepts and is able to apply the concepts in all and novel situations. Has full mastery of the content of the course.
90 ≥ B ⁺ > 87 ≥ B > 83 ≥ B ⁻	Good, has a strong understanding of most or all of the concepts and is able to apply them to stated and defined situations.
80 ≥ C ⁺ > 77 ≥ C > 73 ≥ C ⁻	Average, has a basic understanding of the major concepts of the course and is able to apply to basic situations.
70 ≥ D ⁺ > 67 ≥ D > 63 ≥ D ⁻	Below average, has a basic understanding of only the simple concepts and is able to apply to only a limited number of the most basic situations.
60 ≥ F	Demonstrates little to no understanding of the course content.

Grade 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.

Deadlines, Holidays, and Significant Semester Events:

First Day of Class	Monday, January 8, 2024
Last Day to Drop Classes:	Friday, January 12, 2024
Last Day to Add Classes:	Friday, January 12, 2024
Spring Break	Monday, March 18, 2024 - Saturday, March 23, 2024
Withdrawal Deadline	Friday, March 29, 2024
Grade Forgiveness Deadline	Monday, April 22, 2024
Final Exam:	Tuesday, April 30, 2024 1:00 PM – 3:50 PM

Please refer to the [UCF Academic Calendar](#) and the [UCF Exam Schedule](#) for more information such as Exam Dates, Add/Drop, Withdrawal, and Grade Forgiveness Deadlines.

Student Learning Outcomes and Measures

Upon completion of this course, students should be able to apply the fundamentals of semiconductors solid state physics in understanding the operation of optoelectronic devices

The student will be able to understand:

- the relationship between the electron and the photon
- the importance of energy barriers in semiconductors at p-n junctions for electron to photon conversions.
- the core principles underlying the operation of basic optoelectronic devices such as the LEDs, Laser Diodes and Photo Detectors.

Policy Statements

Academic Integrity

Students should familiarize themselves with UCF's Rules of Conduct at <https://scai.sdes.ucf.edu/student-rules-of-conduct/>. According to Section 1, "Academic Misconduct," students are prohibited from engaging in

1. Unauthorized assistance: Using or attempting to use unauthorized materials, information or study aids in any academic exercise unless specifically authorized by the instructor of record. The unauthorized possession of examination or course-related material also constitutes cheating.
2. Communication to another through written, visual, electronic, or oral means: The presentation of material which has not been studied or learned, but rather was obtained through someone else's efforts and used as part of an examination, course assignment, or project.
3. Commercial Use of Academic Material: Selling of course material to another person, student, and/or uploading course material to a third-party vendor without authorization or without the express written permission of the university and the instructor. Course materials include but are not limited to class notes, Instructor's PowerPoints, course syllabi, tests, quizzes, labs, instruction sheets, homework, study guides, handouts, etc.
4. Falsifying or misrepresenting the student's own academic work.
5. Plagiarism: Using or appropriating another's work without any indication of the source, thereby attempting to convey the impression that such work is the student's own.
6. Multiple Submissions: Submitting the same academic work for credit more than once without the express written permission of the instructor.
7. Helping another violate academic behavior standards.
8. Soliciting assistance with academic coursework and/or degree requirements.

Responses to Academic Dishonesty, Plagiarism, or Cheating

Students should familiarize themselves with the procedures for academic misconduct in UCF's student handbook, *The Golden Rule* <https://goldenrule.sdes.ucf.edu/>. UCF faculty members have a responsibility for students' education and the value of a UCF degree, and so seek to prevent unethical behavior and respond to academic misconduct when necessary. Penalties for violating rules, policies, and instructions within this course can range from a zero on the exercise to an "F" letter grade in the course. In addition, an Academic Misconduct report could be filed with the Office of Student Conduct, which could lead to disciplinary warning, disciplinary probation, or deferred suspension or separation from the University through suspension, dismissal, or expulsion with the addition of a "Z" designation on one's transcript.

Being found in violation of academic conduct standards could result in a student having to disclose such behavior on a graduate school application, being removed from a leadership position within a student organization, the recipient of scholarships, participation in University activities such as study abroad, internships, etc.

Let's avoid all of this by demonstrating values of honesty, trust, and integrity. No grade is worth compromising your integrity and moving your moral compass. Stay true to doing the right thing: take the zero, not a shortcut.

Unauthorized Use of Websites and Internet Resources

There are many websites claiming to offer study aids to students, but in using such websites, students could find themselves in violation of academic conduct guidelines. These websites include (but are not limited to) Quizlet, Course Hero, Chegg Study, and Clutch Prep. UCF does not endorse the use of these products in an unethical manner, which could lead to a violation of our University's Rules of Conduct.

They encourage students to upload course materials, such as test questions, individual assignments, and examples of graded material. Such materials are the intellectual property of instructors, the university, or publishers and may not be distributed without prior authorization. Students who engage in such activity could be found in violation of academic conduct standards and could face course and/or University penalties. Please let me know if you are uncertain about the use of a website so I can determine its legitimacy.

Unauthorized Distribution of Class Notes

Third parties may attempt to connect with you to sell your notes and other course information from this class. Distributing course materials to a third party without my authorization is a violation of our University's Rules of Conduct. Please be aware that such class materials that may have already been given to such third parties may contain errors, which could affect your performance or grade.

Recommendations for success in this course include coming to class on a routine basis, visiting me during my office hours, connecting with the Teaching Assistant (TA), and making use of the Student Academic Resource Center (SARC), the University Writing Center (UWC), the Math Lab, etc. If a third party should contact you regarding such an offer, I would appreciate your bringing this to my attention. We all play a part in creating a course climate of integrity.

In-Class Recording

Students may, without prior notice, record video or audio of a class lecture for a class in which the student is enrolled for their own personal educational use. A class lecture is defined as a formal or methodical oral presentation as part of a university course intended to present information or teach enrolled students about a particular subject.

Recording class activities other than class lectures, including but not limited to lab sessions, student presentations (whether individually or part of a group), class discussion (except when incidental to and incorporated within a class lecture), clinical presentations such as patient history, academic exercises involving student participation, test or examination administrations, field trips, private conversations between students in the class or between a student and the faculty member, and invited guest speakers is prohibited.

Recordings may not be used as a substitute for class participation and class attendance and may not be published or shared without the written consent of the faculty member. Failure to adhere to these requirements may constitute a violation of the University's Student Code of Conduct as described in the Golden Rule.

Course Accessibility Statement

The University of Central Florida is committed to providing access and inclusion for all persons with disabilities. Students with disabilities who need access to course content due to course design limitations should contact the professor as soon as possible. Students should also connect with Student Accessibility Services (SAS) <http://sas.sdes.ucf.edu/> (Ferrell Commons 185, sas@ucf.edu, phone 407-823-2371).

For students connected with SAS, a Course Accessibility Letter may be created and sent to professors, which informs faculty of potential course access and accommodations that might be necessary and reasonable. Determining reasonable access and accommodations requires consideration of the course design, course learning objectives and the individual academic and course barriers experienced by the student. Further conversation with SAS, faculty and the student may be warranted to ensure an accessible course experience.

Deployed Active Duty Military Students

If you are a deployed active duty military student and feel that you may need a special accommodation due to that unique status, please contact your instructor to discuss your circumstances.

Campus Safety Statement

Emergencies on campus are rare, but if one should arise during class, everyone needs to work together. Students should be aware of their surroundings and familiar with some basic safety and security concepts.

- In case of an emergency, dial 911 for assistance.
- Every UCF classroom contains an emergency procedure guide posted on a wall near the door. Students should make a note of the guide's physical location and review the online version at <https://centralflorida-prod.modolabs.net/student/safety/index>.
- Students should know the evacuation routes from each of their classrooms and have a plan for finding safety in case of an emergency.
- If there is a medical emergency during class, students may need to access a first-aid kit or AED (Automated External Defibrillator). To learn where those are located, see <https://ehs.ucf.edu/automated-external-defibrillator-aed-locations>.
- To stay informed about emergency situations, students can sign up to receive UCF text alerts by going to <https://my.ucf.edu> and logging in. Click on "Student Self Service" located on the left side of the screen in the toolbar, scroll down to the blue "Personal Information" heading on the Student Center screen, click on "UCF Alert", fill out the information, including e-mail address, cell phone number, and cell phone provider, click "Apply" to save the changes, and then click "OK."
- Students with special needs related to emergency situations should speak with their instructors outside of class.
- To learn about how to manage an active-shooter situation on campus or elsewhere, consider viewing this video <https://youtu.be/NIKYajEx4pk>.

Detailed Course Outline

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.

Weekly Schedule

The course schedule will be posted on Webcourses.