UNIVERSITY OF CENTRAL FLORIDA

OSE 4410 - OPTOELECTRONICS

Section: 0001

Optics and Photonics

Course Information

Term: Fall 2024
Class Meeting Days: MW
Class Meeting Time: 18:00 - 19:15
Class Meeting Location: CROL 0102
Modality: P
Credit Hours: 3.00

Instructor Information

Dr. Yannick Salamin
Office Location: CREOL A219
Office Hours:
Mondays and Wednesdays 1-3pm
Email: yannick.salamin@ucf.edu

Course Description

OSE 4410 OPTIC 3(3,0)Optoelectronics: PR: OSE 3052 with C (2.0) grade or higher or PHY 3722C and PHZ 4404 PR/CR: EEE 3350 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, imaging. Fall, Spring

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 semiconductors materials is noted. Basic devices are then described: photodiodes, light emitting diodes (LEDs), semiconductor optical amplifiers, and laser diodes are then described. Basic specifications and applications of each of these devices are described, including solar cells, imaging with array detectors, and LED displays.

Student Learning Outcomes

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.

ABET Outcome:

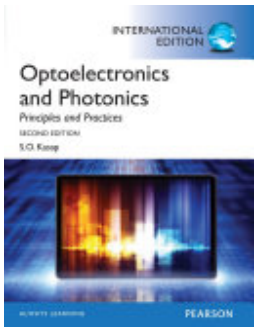
- Graduates have an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

ABET Measure:

- A passing student must be able to design and analyze a system with many components or sub-problems requiring knowledge from multiple disciplines, identifying the conflicting or wide-ranging technical issues, and addressing any relevant standards and codes.

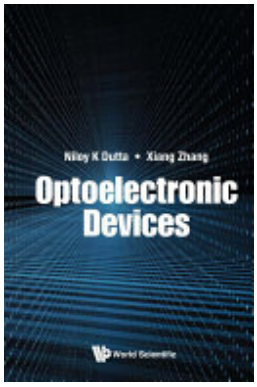
Course Materials and Resources

Optoelectronics & Photonics: Principles & Practices
ISBN: 9780273774181
Authors: Safa O. Kasap

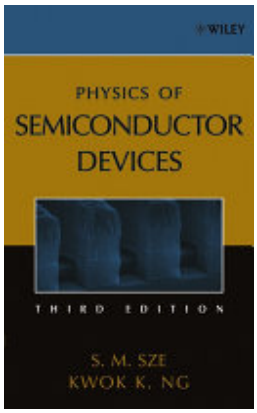


Publisher: Pearson Higher Ed
Publication Date: 2013-11-06

Recommended Course Materials



Title: Optoelectronic Devices
ISBN: 9789813236714
Authors: Dutta Niloy K, Zhang Xiang
Publisher: World Scientific
Publication Date: 2013-09-30



Title: Physics of Semiconductor Devices
ISBN: 9780470068304
Authors: Simon M. Sze, Kwok K. Ng
Publisher: John Wiley & Sons
Publication Date: 2006-12-13

Course Assessment and Grading Procedure

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.

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.

Grading Scheme:

- Attendance (UCF Here App) 5%
- Homework 10%
- Quizzes 20%
- Two mid-term tests (15% & 20%) 35%
- Final Exam 30%

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.

Assignment Schedule

Due Date	Assignment Name	Assignment Type	Points
	Attendance	Assignment	5
9/4	Quiz 1	Assignment	8
9/9	Quizz 2	Assignment	6

Grading Scale

Letter Grade	Percentage
A	94-100%
A-	90-93%
B+	87-89%
B	84-86%
B-	80-83%
C+	77-79%
C	74-76%
C-	70-73%
D+	67-69%
D	64-66%
D-	61-63%
F	0-60%

Policies for Course Grade

Makeup Work 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.

Missed/Late Assignments

If an emergency arises and a student is unable to submit an assignment by the scheduled due date, they must notify the instructor **no later than 24 hours before** the due date or **within 48 hours after**. Upon receiving appropriate documentation, the instructor will determine a new submission deadline.

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.

Course Accessibility

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) (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.

Academic Integrity

Students should familiarize themselves with UCF’s Code of Conduct at Student Conduct and Integrity Office. According to Section 1, “Academic Misconduct,” students are prohibited from engaging in:

a. Academic misconduct is defined as any submitted work or behavior that obstructs the instructor of record's ability to accurately assess the student's understanding or completion of the course materials or degree requirements (e.g., assignment, quiz, and/or exam). Examples of academic misconduct include but are not limited to: plagiarism, unauthorized assistance to complete an academic exercise; unauthorized communication with others during an examination, course

assignment, or project; falsifying or misrepresenting academic work; providing misleading information to create a personal advantage to complete course/degree requirements; or multiple submission(s) of academic work without permission of the instructor of record.

b. Any student who knowingly helps another violate academic behavior standards is also in violation of the standards.

c. Commercial Use of Academic Material. Selling of course material to another person and/or uploading course material to a third-party vendor without authorization or without the express written permission of the University and the instructor of record. Course materials include but are not limited to class notes, the instructor of record's slide deck, tests, quizzes, labs, instruction sheets, homework, study guides, and handouts.

d. Soliciting assistance with academic coursework and/or degree requirements. The solicitation of assistance with an assignment, lab, quiz, test, paper, etc., without authorization of the instructor of record or designee is prohibited. This includes but is not limited to asking for answers to a quiz, trading answers, or offering to pay another to complete an assignment. It is considered Academic Misconduct to solicit assistance with academic coursework and/or degree requirements, even if the solicitation did not yield actual assistance (for example, if there was no response to the solicitation).

Responses to Academic Dishonesty, Plagiarism, or Cheating

Students should also familiarize themselves with the procedures for academic misconduct in UCF's student handbook, *The Golden Rule*. 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 and Academic Integrity, 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.

Reporting an Incident or Issue

If you believe you have experienced abusive or discriminatory behavior by any faculty of staff member, contact the Office of Institutional Equity online or at 407-823-1336. You can also choose to report using the UCF Integrity Line and can report anonymously or as yourself at 1-855-877-6049 or using the online form. UCF cares about you and takes every report seriously. For more information see the Reporting an Incident or Issue Webpage.

Title IX

Title IX prohibits sex discrimination, including sexual misconduct, sexual violence, sexual harassment, and retaliation. If you or someone you know has been harassed or assaulted, you can find resources available to support the victim, including confidential resources and information concerning reporting options at Let's Be Clear and UCF Cares.

For more information on diversity and inclusion, Title IX, accessibility, or UCF's complaint processes contact:

- Title IX – OIE – Office of Institutional Equity & askanadvocate@ucf.edu
- Disability Accommodation – Student Accessibility Services – Student Accessibility Services & sas@ucf.edu
- Access and Community Engagement (including the Ginsberg Center for Inclusion and Community Engagement, Military and Veteran Student Success, and HSI Initiatives)
- UCF Compliance and Ethics Office – Compliance, Ethics, and Risk Office & complianceandethics@ucf.edu
- The Ombuds Office is a safe place to discuss concerns.

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Deployed Active-Duty Military Students

Students who are deployed active duty military and/or National Guard personnel and require accommodation should contact their instructors as soon as possible after the semester begins and/or after they receive notification of deployment to make related arrangements.

Campus Safety

At UCF Public Safety and Police, safety is the top priority. Emergencies on campus are rare, but if one should arise, it's important to be familiar with some basic safety and security concepts.

- In an emergency, always dial 911.
- Every UCF classroom has an **Emergency Procedure Guide** posted on a wall near the door, which will show you how to respond to a variety of situations. This guide can also be found online here.
- In the event of an active threat, remember **AVOID, DENY, DEFEND**. Choose the best course of action and act immediately. Watch the video here to learn more.
    - **AVOID**. Pay attention to your surroundings and have an exit plan. Get as much distance and as many barriers between you and the threat as quickly as possible.
    - **DENY.** When avoiding is difficult or impossible, deny the threat access to you and your space. Lockdown by creating barriers, turning the lights off and

remaining quiet and out of sight. Make sure your cell phone is silenced, but do not turn it off.

    - **DEFEND.** When you are unable to put distance between yourself and the threat, be prepared to protect yourself. Commit to your actions, be aggressive and do not fight fairly. Do whatever it takes to survive.

- For emergencies on campus, UCF will utilize the UCF Alert system. All UCF students, faculty and staff are automatically enrolled to receive these email and text alerts, however, it's a good idea to frequently ensure your contact information is up to date.

Financial Aid Accountability

All instructors/faculty are required to document students' academic activity at the beginning of each course. In order to document that you began this course, please complete this activity by the end of the first week of classes or as soon as possible after adding the course. Failure to do so may result in a delay in the disbursement of your financial aid.

Class Schedule

Week	Topic
1	Intro, Electronic and Optical Processes in Semiconductors
2	Electronic and Optical Processes in Semiconductors
3	Electronic and Optical Processes in Semiconductors
4	Electronic and Optical Processes in Semiconductors
5	Mid-term I, The p-n junction
6	The p-n junction
7	The Light Emitting Diode (LED)
8	The Light Emitting Diode (LED)
9	The Laser Diode
10	The Laser Diode
11	Mid-term II, The Photodetector (photoconductor and photodiode)
12	The Photodetector (photoconductor and photodiode)

Week	Topic
13	The Photodetector (photoconductor and photodiode)
14	Solar Cells (if time permits)
15	Review
16	Finals