



Course Syllabus

OSE 4410L, Optoelectronics Laboratory, 1 credit hour

Instructor: Aravinda Kar
Email: akar@creol.ucf.edu
Phone: (407) 823-6921
Office: CREOL 284
Office Hours: Mondays, 2 PM - 5 PM

Term: Spring, 2020
Class Meeting Days: Tuesdays
Class Meeting Time: 11:00 AM to 1:50 PM (Section 1)
3:00 PM – 5:50 PM (Section 2)
Class Location: CREOL A210
Website: <https://webcourses.ucf.edu>

Additional Notes: I will be in my office at these times, but of course I will be happy to discuss the material with you anytime. The Teaching Assistant's contact information is provided at the end of this document.

Important dates:

First day of classes for OSE 4410L course	Tuesday, January 7, 2020
Instructor to confirm academic activity in each class	Monday, January 6, 2020 - Friday, January 10, 2020
Last day to drop classes and request full refund	Thursday, January 9, 2020
Last day to drop/swap on myUCF	Thursday, January 9, 2020, 11:59 PM
Last day to add classes	Friday, January 10, 2020, 11:59 PM
Written test for this course	Written test that will include all the labs of this course. The date for this test is in the lab schedule at the end of this document.

- **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 www.sds.sdes.ucf.edu or at (407) 823-2371.

- **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 a student has begun the course, each student must complete an academic activity by the end of the first week of classes, or within the first week after adding the course. A student's failure to complete the academic activity will result in a delay in the disbursement of the student's financial aid.

Course Catalog Description:

Basics of semiconductor optoelectronic devices including photodiodes, light-emitting diodes, laser diodes, CCDs. Applications include solar cells, displays, photodetection, and optical communications.

Co-requisites or Prerequisites: OSE 4410 (Optoelectronics)

Detailed Course Description and Learning Outcomes:

Detailed Description: This lab course is associated with the theory course (OSE 4410) on the principles, design, and applications of optoelectronic devices. Basic specifications of key optoelectronic devices, including photodiodes, Light-Emitting Diodes (LEDs), diode lasers, LED and Liquid Crystal Displays are experimentally studied by the students. The experiments include both DC (static) and AC (dynamic) characteristics of the devices and emphasize both the electrical and optical figures of merit. The advantages and disadvantages of various types of photodetectors and light sources are experimentally and quantitatively studied in the lab.

Learning Outcomes:

- Verify various theoretical concepts learned in the lecture class
- Understand how the fundamental concepts affect the performance of practical optoelectronic devices
- Learn measurement techniques to characterize optoelectronic devices
- Experiment with basic devices used in equipment for various applications

Topics: The experiments are listed in the Lab schedule at the end of this document.

Relationship of Course to ABET Criteria:

ABET Criteria	Level of Emphasis During Course (Low, Medium, High)
(a) An ability to apply knowledge of mathematics, science, and engineering.	High
(b) An ability to design and conduct experiments, as well as to analyze and interpret data.	High
(c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.	None
(d) An ability to function on multidisciplinary teams.	None
(e) An ability to identify, formulate, and solve engineering problems.	None
(f) An understanding of professional and ethical responsibility.	Medium
(g) An ability to communicate effectively.	High
(h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.	None
(i) A recognition of the need for, and an ability to engage in life-long learning.	None
(j) A knowledge of contemporary issues.	None
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	None

Textbook:

- Lab Notes
- Optoelectronics and Photonics: Principles and Practices, S. O. Kasap, Prentice Hall, 2001.

Recommended Reference:

- Semiconductor Optoelectronic Devices, P. Bhattacharya, 2nd Ed., Prentice Hall, 1997.
- Semiconductor Optoelectronic Devices, J. Piprek, Academic Press, New York, 2003.
- Fundamentals of Photonics, B. E. A. Saleh and M. C. Teich, 2nd Ed., Wiley, 2007.

Other Reference Books: None

Course Grading and Requirements for Success:

- **In-lab report:** A short report must be submitted by each student at the end of each lab. The report may contain at least a short title of the experiment, experimental procedure, data table, graph, data analysis, conclusion, and answers to in-lab questions. **Experimental data can be shared among the members of the same team, but the rest of the report (e.g., comments and explanations) should be written individually.** Each in-lab report carries 6 points.
- **Written test:** There will be a written test consisting of questions on various aspects of this course. This test carries 34 points.

Grade evaluation:

Academic activity	In-lab report	Written test
Grade weighting (%)	66	34

Grading Scale (%)	Rubric Description
$90 \leq A \leq 100$ $86 \leq A^- < 90$	Excellent with some gradation, 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.
$82 \leq B^+ < 86$ $78 \leq B < 82$ $74 \leq B^- < 78$	Good with some gradation, has a strong understanding of most of the concepts and is able to apply them to stated and defined situations.
$70 \leq C^+ < 74$ $66 \leq C < 70$ $62 \leq C^- < 66$	Average with some gradation, has a basic understanding of the major concepts of the course and is able to apply to basic situations.
$58 \leq D^+ < 62$ $54 \leq D < 58$ $50 \leq D^- < 54$	Below average with some gradation, has a basic understanding of only the simple concepts and is able to apply to only a limited number of the most basic situations.
$F < 50$	Demonstrates no understanding of the course content.

Note: The grading scale may be lowered only at the instructor's discretion depending on the degree of difficulty in the lab and test.

Lab policy

- 1) Class Website:
Lab Notes and In-lab Report Forms will be available on UCF Webcourses before each class.
- 2) Attendance and Late Arrival:
 - 2.1) **Attendance** - Attendance is mandatory in all the lab classes. In case of absence in a lab for no emergency reason, zero credit will be given for that lab. See sections 3 and 4 for absence in a lab due to an emergency reason.
 - 2.2) **Late Arrival** - Two points will be deducted from the scores received in a report for a student arriving late by 10 through 20 minutes. In case of arriving late to a lab by more than 20 minutes, zero credit will be given for that lab.
- 3) Make-up Lab and Late Submission of Report due to Emergency Reason:
 - 3.1) **Make-up Lab due to Emergency Reason** - If an emergency arises and a student cannot attend a Lab on the scheduled date, the student **must** notify the instructor **no less than 24 hours before** the scheduled date and **no more than 48 hours after** the scheduled date. A make-up lab session will be arranged if official documents regarding the emergency are submitted to the instructor. The instructor will specify a new due date for submitting the report of the make-up lab. The late submission rule of section 4.2 will apply if the student fails to submit the report by the new due date. Any illness will be considered a medical emergency only if a doctor's letter, which confirms the illness, is submitted to the instructor as an official document within the time mentioned in this section. Zero credit will be given for the lab without official documents.
 - 3.2) **Late Submission of Report due to Emergency Reason** - If an emergency arises and a student cannot submit assigned work on or before the scheduled due date, the student **must** notify the instructor **no less than 24 hours before** the scheduled date and **no more than 48 hours after** the scheduled date. The instructor will specify a new due date for submitting the report after receiving official documents from the student. The late submission rule of section 4.2 will apply if the student fails to submit the report by the new due date. Any illness will be considered a medical emergency only if a doctor's letter, which confirms the illness, is submitted to the instructor as an official document within the time mentioned in this section. Zero credit will be given for the lab without official documents.
- 4) Grading:
 - 4.1) **Emergency** -Late submissions are acceptable for grading in case of emergency if official documents regarding the emergency are submitted to the instructor within the time mentioned in section 3. Failing to do so will earn zero credit for the missed submission. Any illness will be considered a medical emergency only if a doctor's letter, which confirms the illness, is submitted to the instructor as an official document within the time mentioned in section 3. The instructor will specify a new due date for submitting the report after receiving official documents from the student. The late submission rule of section 4.2 will apply if the student fails to submit the report by the new due date.
 - 4.2) **Late Submission** – If the report is submitted late for no emergency reason, 1 point will be deducted per day for the first three days after the due date of the report. Zero credits will be given if the report is submitted more than three days after the due date. If the report is submitted N days late and the report receives a score of S points out of the total points assigned to the report, the final score for the report will be S-N. A fraction of a day will be counted as 1 day for determining N.
- 5) Grade Objections:
All objections to grades should be made **in writing within one week** after the report is graded on webcourses. Objections made after this period has elapsed will **not** be considered – NO EXCEPTIONS.
- 6) Academic Integrity:

- 6.1) A group of two or more students may work as a team to carry out the experiments, but each student has to turn in their own pre-lab, in-lab, preliminary and final reports without copying from other students or sources. Experimental data can be shared among the members of the same team, but the rest of the report should be written individually.
- 6.2) UCF's rule will apply in the case of any breach in the academic integrity.

7) Lab Etiquette:

- 7.1) A group of two or more students may work as a team to carry out the experiments. Each student is required to fully participate in the experiments and cooperate with other team members.
- 7.2) Foods and drinks are not allowed in the lab.
- 7.3) Use of cellphones, headphones, writing homeworks or any activities unrelated to the lab are not allowed.
- 7.4) Students should not disturb or interfere with neighboring groups.
- 7.5) Keep your optical table area neat and free of any unnecessary tools and equipment. Your book bag and other personal belongings should be kept in a designated area away from the optical table.
- 7.6) After completing your experiment, turn off all equipment, disassemble the experimental setup and separate the circuit elements in groups of similar apparatus, e.g., all resistors and electrical connectors should be separated as two groups of apparatus.
- 7.7) Contact your TA to return all the components that you took at the beginning of the lab.
- 7.8) Clean your optical table before you leave the lab.

8) Lab safety:

- 8.1) Do not look at any laser beam or even the LED light directly.
- 8.2) Do not be in the path of any laser beam or even the LED light.
- 8.3) Wear safety goggles. The goggles should be suitable for the power and wavelength of the light that you will use in your experiment.

9) Professionalism and ethics:

Per university policy and plain classroom etiquette, mobile phones, etc. must be silenced during all classroom lectures, unless you are specifically asked to make use of such devices for certain activities. Academic dishonesty in any form will not be tolerated! If you are uncertain as to what constitutes academic dishonesty, please consult The Golden Rule in the UCF Student Handbook (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.

Lab schedule

Date	Lab No.	Lab type	Topic	Point
1/07	0		Introduction, syllabus, grading policy, lab etiquette, review of basic apparatus	
1/14	1	Optical emitter (Lab type A)	Light-emitting diodes: Red and blue (I-V, I-P)	6
1/21	2		Light-emitting diodes: Red and blue (Spectrum)	6
1/28	3		Laser diodes: Red and blue (I-V, I-P)	6
2/04	4		Laser diodes: Red or blue (Spectrum)	6
2/11	5		Optical absorber (Lab type B)	Photoconductor - Optoelectronic effect for light detection
2/18	6	Photodiode: PIN photodetector		6
2/25	7	Photodiode: Solar cell (photovoltaic effect for power generation)		6
3/03	8	Application (Lab type C)	LED digital display and Liquid crystal digital display	6
3/10	--		Spring break (3/09 – 3/14)	
3/17	9		Optical transmitter receiver: Optical output by free space transmission of optical signal	6
3/24	10		Optical transmitter receiver: Audio output by free space transmission of optical signal	6
3/31	11		Quadrant photodiode	6
4/7	No lab.			
4/14	Written test that will include all the labs of this course.			34
4/21	UCF Final Examination Period: 4/21-4/27. UCF classes end on Monday (4/20).			

Teaching Assistant: Arifur Rahaman, (509) 339-4615, arahaman16@Knights.ucf.edu