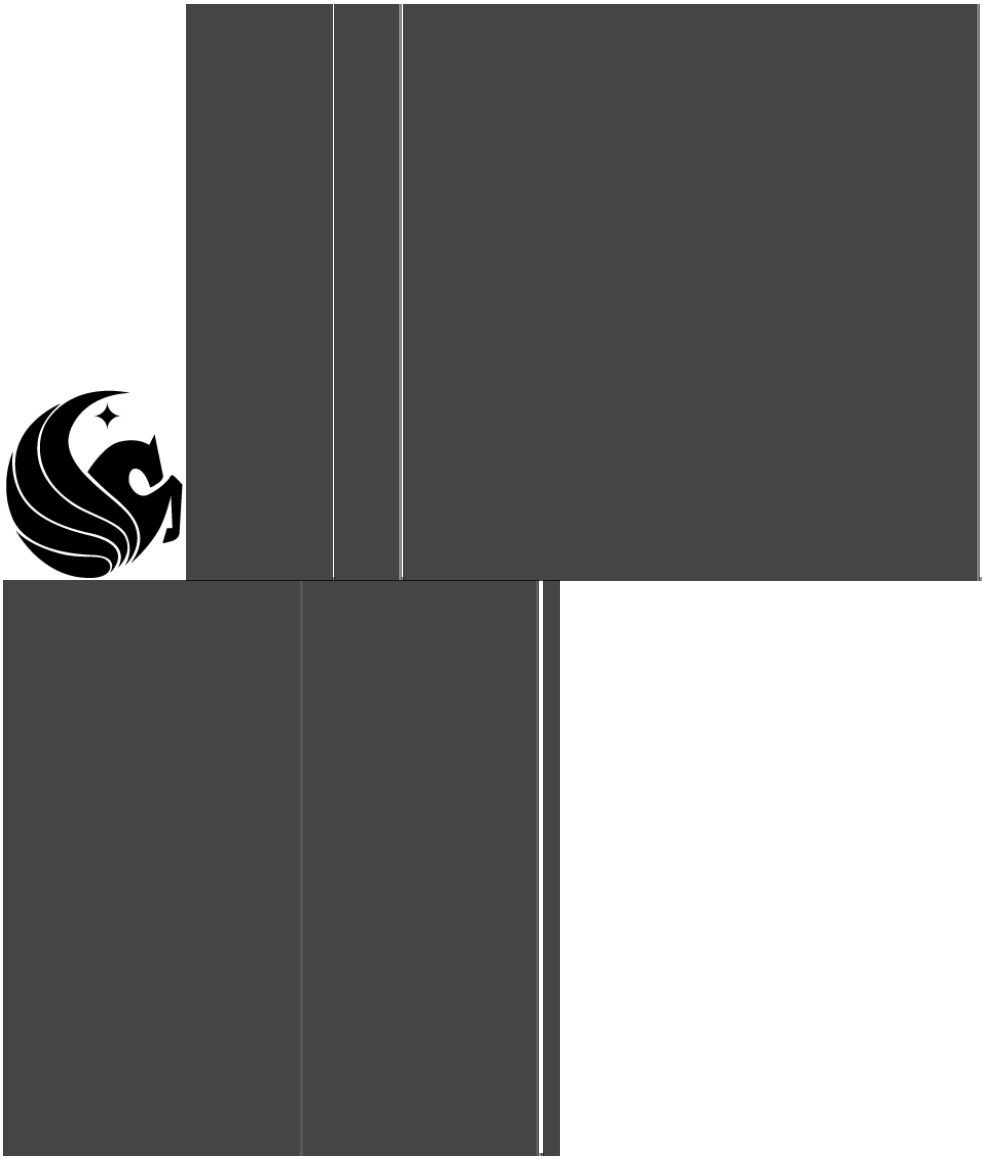
CREOL OSE 6526C: Laser Engineering Lab College of Optics and Photonics, Spring 2019 University of Central Florida



Instructor: Office:

Phone: E-Mail:

Website: Office Hours:

Welcome!

Dr. Martin Richardson Rm 126, CREOL Building

407 823 6819

mcr@ucf.edu

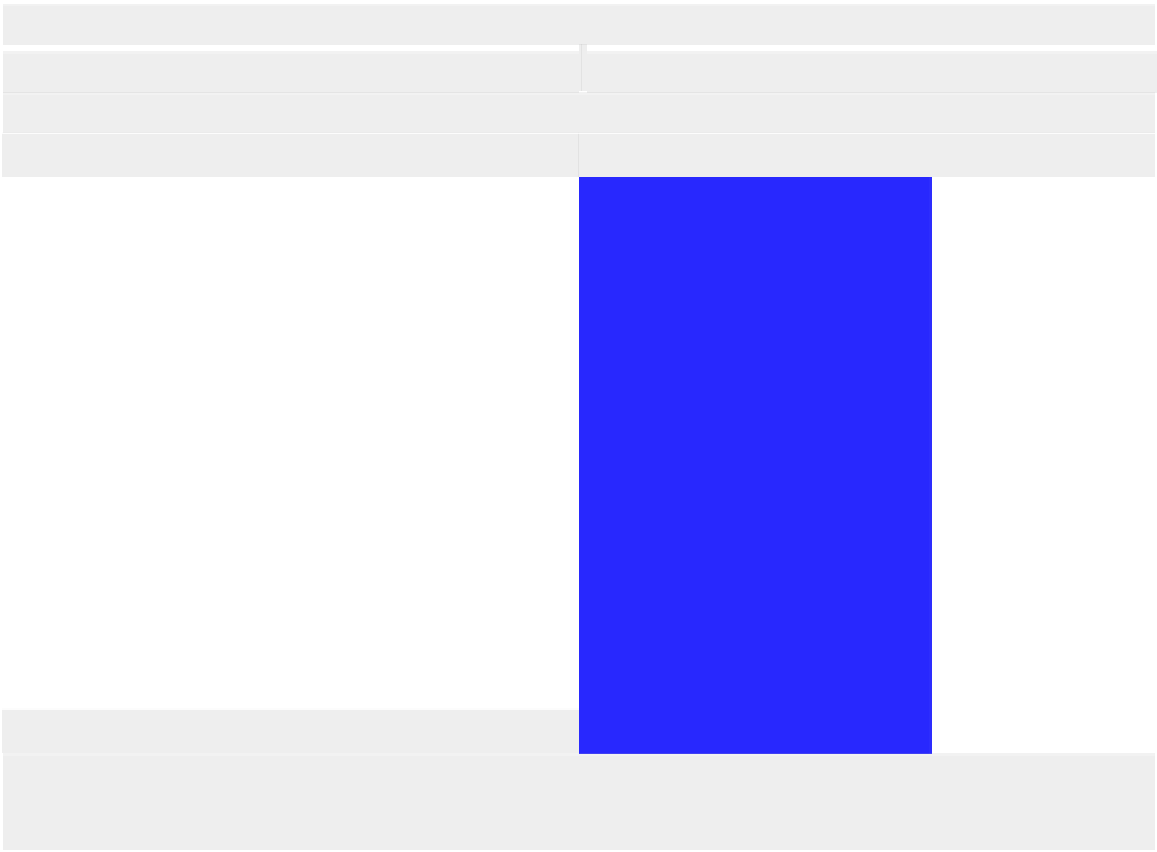
COURSE SYLLABUS

Term: Class Days:

Class Hours: Class Location:

Summer 2019 Mondays

4:30 - 9:00 pm Room 265



https://www.creol.ucf.edu/person/martin-c-richardson/Fridays, 5-6 pm (or arrange by email)

TA: Haley Kerrigan, Jessica Pena, Patrick Roumayah, Justin Cook.

I. II.

Welcome to CREOL OSE 6526C course: Laser Engineering Lab.

University Course Catalog Description:

The goal of this hands-on course is to obtain good practices of laser experiment. You will learn how to build a solid-state laser from scratch! In addition, you will learn how to acquire, process, and interpret experimental data and write a report in a format of a scientific paper.

III. Course Overview:

The course consists of a sequence of six interconnecting experiments based on a diode-pumped solid- state Nd:YAG laser. The experiments will be carried out in groups of two. In laboratory sessions students will learn the practical aspects of handling optics, laser tuning and laser diagnostics – something that is not usually taught in a classroom course.

The students will first get some acquaintance with a working laser: they will evaluate stability and sensitivity of the laser operation with respect to alignment of the laser mirrors and with respect to changing the laser cavity length. Then they will build (starting from Lab work 2) their own solid-state laser from scratch, beginning with characterizing a laser diode that will be used as a pump source. The students will measure efficiency of the laser they have built, perform second harmonic (green) generation, and study the efficiency of the second harmonic generation process as a function of different factors. The students will also study giant-pulse (Q-switched) Nd:YAG laser operation as well as laser build-up dynamics when the diode pump is abruptly turned on.

During the course, the students will learn how to record, process and interpret experimental data. The students are expected to make notes in laboratory notebooks. The use of computers in the laboratory (and software such as Excel, Origin, Matlab and other) is encouraged. In addition, students are encouraged to perform independent literature searches to find explanations to their experimental findings.

The course is suitable for the first-time users of lasers, though students must have an understanding on how the lasers work. Because of equipment and space limitations, participation is capped at 12 students (6 teams of two). Classes are held once a week in 4.5-hour sessions. Total there will be 6 experiments with two sessions (two weeks) allocated per each experiment.

IV. Course Prerequisites:

OSE6525 - Laser Engineering or other approved Laser Courses

V. Course Credits:

3(3, 0)

VI. Reference Textbooks:

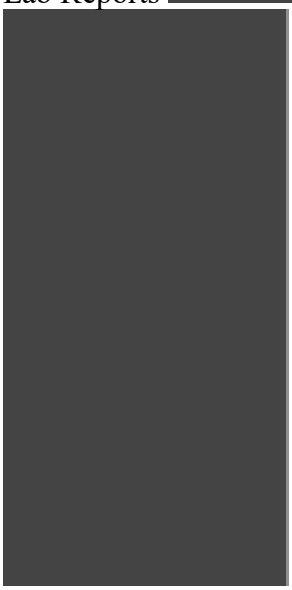
- *Lasers*, Anthony E. Siegman, University Science Books, c1986
- *Quantum Electronics,* A. Yariv, John Wiley & Sons, 1989.
- *Principles of Lasers*, O. Svelto, Springer, 2010
- *Laser fundamentals*, William T. Silfvast, Cambridge University Press, 1996. •*Laser electronics*, Joseph T. Verdeyen, Prentice Hall, 1989.

- *Wikipedia*

VII. Basis for Final Grade:

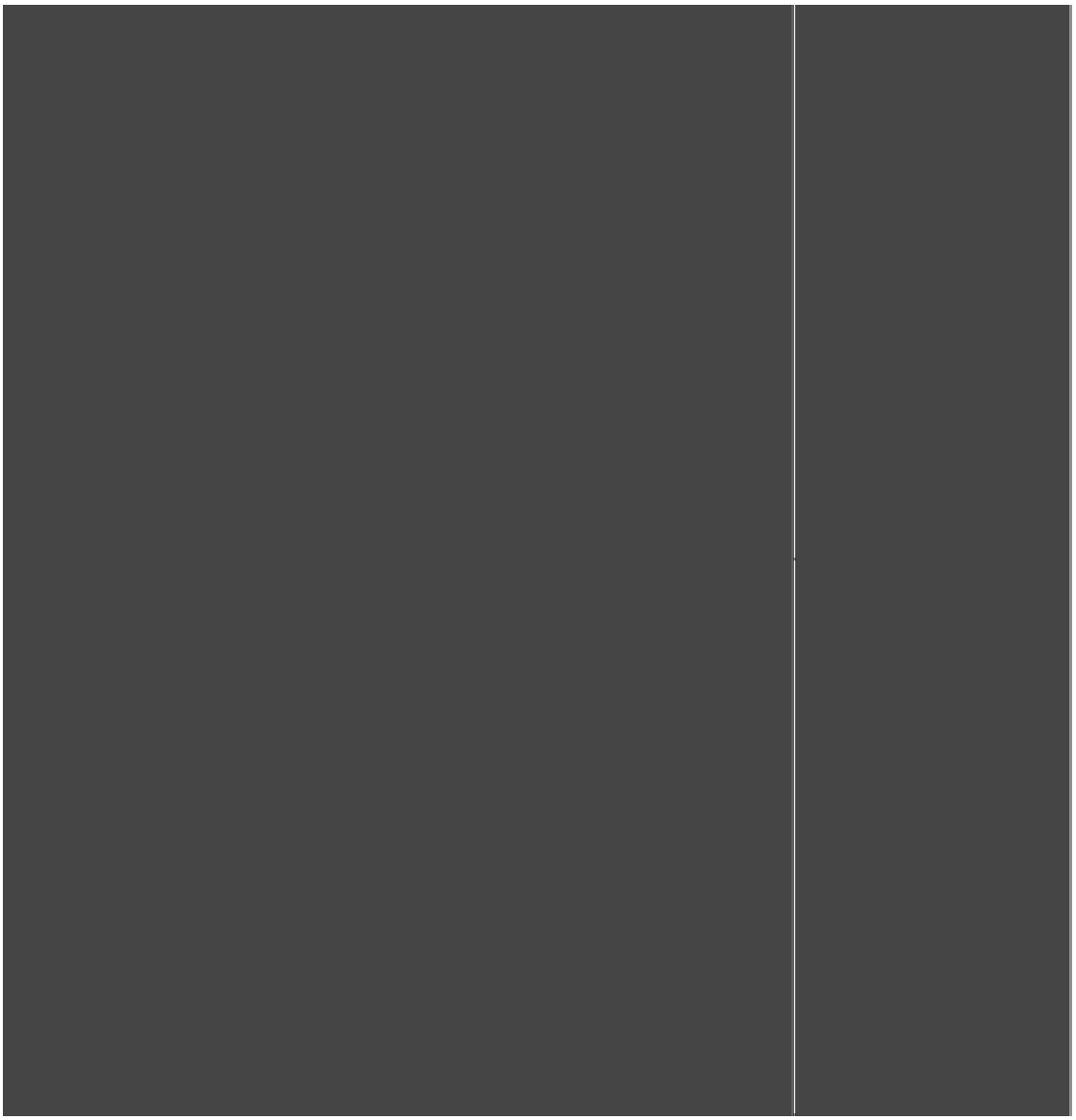
Assessment

Lab Reports



100%

Percent of Final Grade



Grading scale:

100%

~~Grading Scale (%) 90-100 [redacted] A 80 - 89 B 70 - 79 C 60 - 69 D 0 - 59 F~~

[redacted]

VIII. Lab Reports

Lab reports should be submitted in ***pdf*** **format**, no later than 11:59 pm on Sunday of the 2-nd week for

each experiment (in other words, the night before the next experiment starts). A team of two students

does each experiment, however each student writes his/her own report. Experimental data may be shared, but the reports must be the students own work. Plagiarism between students is unacceptable.

There will be a reduction in the grade of 10% per day for late submissions.

IX. Grade Dissemination

X.

You can access your scores using UCF *Webcourses*. **Course Policies: Grades**

Late Work Policy: As a rule, there are no make-ups for the laboratory work. The lab work needs to be done only during allocated hours.

Grades of "Incomplete":
The current university policy concerning incomplete grades will be followed in this course. 'Incomplete' grades are given only in situations where *unexpected emergencies prevent a student from completing the course and the remaining work can be completed the next semester*. Instructor is the final authority on whether you qualify for an 'incomplete'. Incomplete work must be finished by the end of the subsequent semester or the “I” will automatically be recorded as an “F” on your transcript.

XI. Course Policies: Technology and Media
Email: Please use email *mcr@ucf.edu* for all correspondence.

Website: All information concerning the course will be posted on *Webcourses*. This site will reflect latest changes and contain assignments for the coming lab work

XII. Course Policies: Student Expectations

Disability Access: The University of Central Florida is committed to providing reasonable accommodations for all persons with disabilities. Students with disabilities who need accommodations in this course must contact the professor at the beginning of the semester to discuss needed accommodations. No accommodations will be provided until the student has met with the professor to request accommodations. Students who need accommodations must be registered with Student Disability Services, Student Resource Center Room 132, phone (407) 823-2371, TTY/TDD only phone (407) 823-2116, before requesting accommodations from the professor.

Attendance Policy:
• In registering for this course, all students are accepting the obligation to attend all classes. Since the course is a series of sequential classes, building on the previous class, students cannot miss any classes. Exceptions to this will only be given for medical and emergency reasons.

Professionalism Policy:
Per university policy and classroom etiquette: mobile phones etc. **must be silenced** during all classroom lectures. Those not heeding this rule will be asked to leave the classroom immediately so as to not disrupt the learning environment. Students who habitually disturb the class by talking, arriving late, *etc*., and have been warned may suffer a reduction in their final class grade.

For reasons of safety, students should not wear flipflops or loose clothing. They will be working in a laser beam and electronics environment where caution and common sense is required.

Academic Conduct Policy:
Academic dishonesty in any form will not be tolerated. As in all University courses, The Golden Rule

of Conduct will be applied. Violations of these rules will result in a record of the infraction being placed in your file and 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.

XIII. Important Dates to Remember

Drop/Swap Deadline: Jan 10, 2019

XIV. Schedule 2019

1	13May	Introduction to the Laser Lab. Course logistics. Lab. Work 1: Mode characterization of a laser, part I
2	20 May	Lab. Work 1: Mode characterization of a laser, part II
	27 May	**Holiday. Memorial Day**
3	3 Jun	Lab. Work 2: The laser diode, part I
4	10 Jun	Lab. Work 2: The laser diode, part II
5	17 Jun	Lab. Work 3: The Nd:YAG laser, part I
6	24 Jun	Lab. Work 3: The Nd:YAG laser, part II
7	1 jul	Lab. Work 4: Second harmonic generation, part I
8	8 Jul	Lab. Work 4: Second harmonic generation, part II
9	15 Jul	Lab. Work 5: Q-Switching of Nd:YAG laser, part I
10	22 Jul	Lab. Work 5: Q-Switching of Nd:YAG laser, part II
11	29 Jul	Lab. Work 6: Relaxation Oscillations, part I &II
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.	3 aug	Submit your final report .
[redacted]	7 Aug	[redacted] Final Grades posted