CREOL OSE 6526C: Laser Engineering Lab
College of Optics and Photonics, Spring 2016
University of Central Florida

COURSE SYLLABUS

Instructor:	Dr. Konstantin Vodopyanov	Term:	Spring 2016
Office:	CREOL Room A113	Class Days:	Mondays
Phone:	407 823 6818	Class Hours:	4 - 9 pm
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I. Welcome!

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

II. 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 working 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 the laser cavity mirror alignment and laser cavity length. Then they will characterize laser diodes that are used as a laser pump and eventually will build their own solid-state laser. The students will perform second harmonic (green) generation experiments and will study second harmonic efficiency dependence on different factors. They will study pulsed (Q-switched) Nd:YAG laser operation as well as the laser build-up dynamics when the diode pump is abruptly turned on.

During the course, we will discuss recording, processing and treatment of experimental data, and also note-taking. 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 the correct 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. Participation is capped at 12 students, because of equipment and space limitations. Sessions are held once a week (in 5-hour sessions). Total there will be 6 experiments. There are two sessions allocated per each experiment (that is two weeks per experiment).

IV.   Course Prerequisites:

OSE6525 - Laser Engineering or other approved Laser Courses

V.   Course Credits:

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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.

VII.   Basis for Final Grade:

Assessment	Percent of Final Grade
Lab Reports	100%
	100%

Grading scale:

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

VIII.   Lab Reports

Lab reports should be submitted as *pdf* files in a special (*Optics Letters* style) format (template will be posted in *Webcourse*), no later than 11:59 pm on Sunday of the 2-nd week for each experiment. A team of two students does each experiment, however each student writes his/her own report (experimental data may be shared). There will be a reduction in the grade of 10% per day for late submission.

## IX.	Grade Dissemination

You can access your scores using UCF *Webcourse*.

## X.	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 vodopyanov@creol.ucf.edu for all correspondence.

Website: All information concerning the course will be posted at *Webcourse*. 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:
• Students must be on time to class.
• If missed a class (for a good cause), it is the responsibility of the student to arrange with a TA an extra time for doing experiment. One extra week (at the end of semester) will be allocated in case students want to redo any experiment if they want to get a better grade.

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.

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 14, 2016

XIV.   Schedule

1	11-Jan	Course logistics. Introduction to Laser Lab. How to process and interpret data. Handling and cleaning laser optics and other good practices of laser experiment. Lab. Work 1: Mode Characterization of a Laser, part I
	18-Jan	**Holiday. Martin Luther King Jr. Day.**
2	25-Jan	Lab. Work 1: Mode Characterization of a Laser, part II
3	1-Feb	Lab. Work 2: The laser diode, part I
4	8-Feb	Lab. Work 2: The laser diode, part II
	15-Feb	No class: Photonics West Conference in San Francisco
5	22-Feb	Lab. Work 3: The Nd:YAG laser, part I
6	29-Feb	Lab. Work 3: The Nd:YAG laser, part II
	7- Mar	**Spring Break**
7	14- Mar	Lab. Work 4: Second harmonic generation, part I
8	21- Mar	Lab. Work 4: Second harmonic generation, part II
9	28-Mar	Lab. Work 5: Q-Switching of Nd:YAG laser, part I
10	4-Apr	Lab. Work 5: Q-Switching of Nd:YAG laser, part II
11	11-Apr	Lab. Work 6: Relaxation Oscillations, part I
12	18-Apr	Lab. Work 6: Relaxation Oscillations, part II
13	25-Apr	Optional: you can redo any of your experiments and improve your grades
14	2-May	Final Grades will be posted