



CREOL OSE 6526C: Laser Engineering Lab
College of Optics and Photonics, Spring 2015
University of Central Florida

COURSE SYLLABUS

Instructor:	Dr. Konstantin Vodopyanov	Term:	Summer 2015
Office:	CREOL Room A113	Class Days:	Mondays
Phone:	407 823 6818	Class Hours:	4 - 9 pm
E-Mail:	vodopyanov@creol.ucf.edu	Class Location:	Rm 265
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Office Hours:	Fridays 5-6 pm	TA: Jian Zhao, Nathan Bodnar	

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 some good practices of laser experiment, learn how to build a solid-state laser from scratch, learn how to acquire, process, and interpret experimental data and write a report in a format of real scientific paper.

III. Course Overview:

The course consists of a sequence of six inter-connecting experiments based on a diode-pumped solid-state Nd:YAG laser. The experiments will be carried out in groups of 2. In the lab sessions students will learn the practical aspects of handling optics, electronics, and diagnostics that are not usually in a classroom course.

The students will evaluate stability and sensitivity of the laser operation with respect to the laser cavity length and cavity mirror alignment. Also, 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 phase matching and harmonic power dependence on different factors. They will study pulsed (Q-switched) Nd:YAG laser operation. Also the laser build-up dynamics (relaxation oscillations) of laser radiation will be studied when the laser is abruptly turned 'on'.

During the course, we will discuss experimental data recording, processing and treatment of data, and also note-taking. Students are expected to make notes in a laboratory notebook. The use of computers in the laboratory (e.g. Excel, Origin, Matlab software) is encouraged. In addition, students will perform

independent literature searches of the reference materials to find the correct explanations to their experimental findings. We will cover most important issues of laser safety.

The course is suitable for first-time users of lasers, though students must have a thorough understanding of how they work. Participation is capped at 12 students, because of equipment and space limitations. Sessions are held one evening (5 hours) per week.

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 resonators and the beam divergence problem*, Yurii A. Anan'ev, Adam Hilger, 1992.
- *Laser electronics*, Joseph T. Verdeyen, Prentice Hall, 1989.
- *The laser book: a new technology of light*, Clifford L. Laurence, Prentice Hall, 1986.
- *CRC handbook of laser science and technology*, editor, Marvin J. Weber, CRC Press, 1982

VII. Basis for Final Grade:

Assessment	Percent of Final Grade
Pre-lab interview	20%
Lab Reports	80%
	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 (*Optics Letters* style format, in *pdf*) no later than 11:59 pm on Sunday of the 2-nd week for each experiment. There will be 10% per day reduction in the grade for late submission.

IX. Grade Dissemination

Graded tests and materials in this course will be returned individually only by request. You can access your scores using UCF "Webcourse".

X. Course Policies: Grades

Late Work Policy: 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.

Professionalism Policy:

Per university policy and classroom etiquette; mobile phones, iPods, *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. Please arrive on time for all class meetings. 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 Rules 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

Withdrawal Deadline:

July 06, 2015

XIV. Schedule

1	18-May	Course logistics. Introduction to Laser Lab. Handling and cleaning laser optics. Lab. Work 1a: Spatial mode analysis and cavity stability study of a Nd:YAG laser.
	25-May	Holiday. Memorial Day.
2	1-Jun	Lab. Work 1b: Spatial mode analysis and cavity stability study of a Nd:YAG laser
3	8-Jun	Lab. Work 2a: The laser diode
4	15-Jun	Lab. Work 2b: The laser diode
5	22-Jun	Lab. Work 3a: The Nd:YAG laser
6	29-Jun	Lab. Work 3b: The Nd:YAG laser
7	6-July	Lab. Work 4a: 2nd harmonic generation
8	13-July	Lab. Work 4b: 2nd harmonic generation
9	20-July	Lab. Work 5a: Q-Switching of Nd:YAG laser
10	27-July	Lab. Work 5b: Q-Switching of Nd:YAG laser
11	3-Aug	Lab. Work 6: Relaxation Oscillations
12	10-Aug	Grades finalized