UCF CREOL, THE COLLEGE OF OPTICS AND PHOTONICS

Course Syllabus

OSE 3052L - Introduction to Photonics Laboratory

Instructor: Prof. Axel Schülzgen

Email: axel@creol.ucf.edu

Phone: 407-823-1746

Office: CREOL A115

Office hours: Wednesday and Thursday 2:00 – 3:00 pm

Class location: CREOL A210

Class meeting days: Thursday

Class meeting time: 4:30 – 7:30 pm

Class website: UCF Webcourses

Credit Hours: 1 credit hour – 2 contact hours

Co-requisite: OSE3052 – Introduction to Photonics or equivalent

Objective:

The objective of this lab to become familiar with the fundamental properties of light, explore optical phenomena in a laboratory setting, make careful measurements, and draw own conclusions about the models and theories that describe these phenomena.

Description:

The laboratory course is designed to reinforce the concepts discussed in class with a hands-on approach and to allow the students to learn laboratory techniques for observing optical phenomena and quantitative experimental characterization in geometrical optics, polarization, interference, and diffraction.

Learning outcomes:

After successful completion of this course, students will be able to:

- Comment on basic concepts and principles of geometrical optics, dispersion, aberration, polarization, interference, and diffraction
- Discuss the nature of light, its propagation, polarization and reflection and refraction at planar interfaces
- Describe basic optical phenomena and their applications
- Handle and align optical elements and set up basic optical experiments
- Operates optical devices and equipment
- Present their observations and conclusions in a clear informative document

Course Materials and Textbook:

- **Introduction to Optics,** F. Pedrotti, L. Pedrotti, and L. Pedrotti, Addison-Wesley, 3rd Edition, 2006.
- **Fundamentals of Photonics**, B. E. A. Saleh and M. C. Tiech, Wiley, 2nd Edition, 2007.
- Relevant theoretical background material for the experiments will be provided on the course website https://webcourses.ucf.edu/

Course Requirements:

- The student is expected to review the textbooks, notes, and the lab handout and come to lab prepared to perform the scheduled experiment.
- A bound pre-numbered laboratory notebook must be used to properly document all experimental procedures, observations, data, and measurements during the laboratory session. All entries must be in ink. The notebook must be dated and signed by the lab instructor or his teaching assistant. Raw data may be processed later. Lab notebooks will be examined periodically and collected at the end of the semester.
- A type-written, clear, and informative laboratory report (in Word or PDF format) must be prepared for each experiment. The report must include the experiment title, objective, introduction and theory, experimental method, results and data analysis, observations, conclusions, and references.

Grading policy:

The final grade will be based upon:

Laboratory participation	20%
Pop quiz / Oral Final Exam	20%
Lab reports	50%
Laboratory notebook	10%

- Lab notebooks will be examined periodically and collected at the end of the semester
- Lab reports must be submitted through Webcourses at http://webcourses.ucf.edu/ by 11:59 pm of the next Thursday after the experiment is completed.
- Lab reports sent via email or hard copy will NOT be accepted.
- Absences and Makeup Lab Sessions:
  - Because of the fluid nature of the lab with the experimental setup changing every week, there will be NO MAKEUPS ALLOWED except in cases of genuine emergency.
  - It is expected and encouraged that students finish their experiments within the assigned class time on Thursdays. However, with prior arrangements with the teaching assistant, students may be allowed to access the lab before and after the class time of the same week.
  - The instructor reserves the right to change or modify any portion of this schedule without prior notice or recourse by the students.

Guide for Preparing Lab Reports:

The objective of the lab is to understand fundamental concepts related to photonics, explore physical phenomena in a laboratory setting, make careful measurements, and draw your own conclusions about the models and theories which are supposed to describe these phenomena. The lab report should reflect these objectives.

Content:

The report should include the following sections (as appropriate):

Objective: State purpose or objective of the lab session or experiment.

Theory: Provide a (less than a page) brief summary of concepts and relationships involved. Necessary equations or formulae are to be stated and referenced.

Experiment setup: List equipment used with *sketches* where appropriate.

Procedure: Summarize experimental procedure and measurement techniques.

Results: Present raw data, calculations, numerical modeling of experimental results when appropriate.

Error Analysis: Comment as to the magnitude and origin of uncertainty of the raw experimental measurements and discuss how these raw uncertainties propagate to affect the final calculated results. If the data is suspect, discuss possible flaws in technique or measurements.

Discussion: Discuss the specific topics provided at the beginning of lab description.

Conclusions: Summarize results in a concise manner and state conclusions.

Lab Report Format:

- The lab report must be in Word or PDF format with Arial font size 12, double-spaced and one inch margins and no longer than 6 pages. Any report that does not follow this format is not acceptable and will be returned without grading.
- The report must be informative and well-organized with clearly labeled graphics and defined symbols.
- *For additional information and tips, please see:* Christopher S. Lobban & Maria Schefter, Successful Lab Reports: A Manual for Science Students (Cambridge: Cambridge University Press, 1992) or search the web with the quoted phrase "How to Write a Lab Report".

Guidelines for lab report grading:

10 Perform the experiment mechanically correct, obtain acceptable results, and submit an exemplary report, in which you exhibit profound and exalted insight.

9 Perform experiment mechanically correct, obtaining acceptable results. Submit nice report exhibiting significant physical insight.

8 Submit a complete report exhibiting only minor errors and run-of-the-mill inspiration.

7 Submit a report containing imperfections (either incomplete or containing incorrect statements).

6 Report exhibits major errors or omissions.

0-5 Poor report

University Rules on 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, the University of Central

Florida's Student Handbook (http://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.

Academic Ethics Specific to This Lab Course

It is the nature of a laboratory course that you will be working in groups. Obviously, those of you who are lab partners will be using the same raw data. You are encouraged to discuss your observations and insights with your lab partners; however, each of you has to write your own ORIGINAL lab reports.

Cheating and plagiarism are serious breaches of the UCF Code of Honor as described in the UCF Golden Rule and the UCF Creed, and will not be tolerated in this course. All cases will be reported to the Office of Student Conduct (OSC).

Definitions

Cheating: any unauthorized assistance in graded, for-credit assignments.

Plagiarism: appropriating the work of others and claiming, implicitly or explicitly, intentionally or unintentionally, that it is your own.

With increased use of the internet, digital plagiarism is becoming more of a problem on campuses everywhere. You are encouraged to use the internet; however, electronic copying and pasting of material directly into reports and papers without proper reference of the source is blatant plagiarism. **Always reference the sources of information.**

Providing a fellow student with experimental data from an experiment in which he/she did not participate is also forbidden. All parties that are involved in such practice will be reported to UCF Office of Student Conduct (OSC).

If there is any question concerning acceptable practice in this laboratory course, don't hesitate to ask the instructor.

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 http://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 you began this course, please complete the following academic activity by the end of the first week of classes, or as soon as possible after adding the course, but no later than August 27; Certify that you have been educated in laser safety procedures. Failure to do so will result in a delay in the disbursement of your financial aid.

Class Website:

Materials used for classes will be available on UCF Webcourses for download before each class.

List of Experiments (week-by-week calendar; subject to modifications)

1	August 21	Introduction, procedures, laser safety, data analysis Basic optics laboratory setup, alignment, collimation, spatial filtering
2	August 28	Experiment #1: measurement of paraxial properties of a lens, surface power, and focal length.
3	September 4	Experiment #1(cont.): use of the Newtonian distances and reciprocal magnification techniques determining the focal length and principal planes of a lens and lens system
4	September 11	Experiment #2: observation of longitudinal chromatic aberration of a lens
5	September 18	Experiment #2 (cont.): measurement of longitudinal chromatic aberration of a lens
6	September 25	Experiment #3: observation of monochromatic aberrations of a point source
7	October 2	Experiment #3(cont.): observation of monochromatic aberrations of a point source
	October 9	FOOTBALL UCF vs. Brigham Young
8	October 16	Experiment #4: state of polarization, wave plates, change of the polarization state, polarization-dependent
9	October 23	Experiment #4 (cont.): Fresnel coefficients and the Brewster angle
10	October 30	Experiment #5: Basic diffraction phenomena, Young's double slit experiment
11	November 6	Experiment #5 (cont.): Basic diffraction phenomena, Fresnel and Fraunhofer diffraction
12	November 13	Experiment #6: Basic interference phenomena, Lloyd's mirror, Newton interferometer
13	November 20	Experiment #6 (cont.): Basic interference phenomena, Michelson interferometer, Fabry-Perot interferometer
14	November 27	THANKSGIVING
15	December 4	Oral Final Exam