UCF CREOL, THE COLLEGE OF OPTICS AND PHOTONICS

Course Syllabus
OSE 3052 L - Introduction to Photonics Laboratory

Instructor: Dr. Ivan Divliansky

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Office: CREOL 110

Office hours: Monday 2:00 – 3:00 pm

Class location: CREOL A210

Class meeting days: Wednesday

Class meeting time: 5:00 – 7:50 pm

Class website: UCF Webcourses

Credit Hours: 1 credit hour – 2 contact hours

Co-requisite: OSE 3052 – 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. Teich, Wiley, 2nd Edition, 2007.
- Relevant theoretical background material for the experiments will be provided on the course website https://webcourses.ucf.edu/

Course Requirements (additional details on Page 6):

- The student is expected to review the textbooks, notes, and the lab handout and come to lab prepared to perform the scheduled experiment.
- A 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. Lab notebooks will be graded using the guidelines described in the table on Page 7 of this Notebook.
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Grading policy:

The final grade will be based upon:	Laboratory participation	20%
	Laboratory notebooks	60%
	Formal laboratory report	20%

- Lab notebooks will be handed out to you on the first day of the course and collected every other week after the experiments are completed.
- 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 Wednesdays. 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.

Grading Scale (%)	Rubric Description
$100 \geq A > 93 \geq A^{-} > 90$	Excellent, has a strong understanding of all concepts and is able to apply the concepts in all experiments. Has full mastery of the content of the course and lab report writing.
$90 \geq B^{+} > 87 \geq B > 83 \geq B^{-} > 80$	Good, has a strong understanding of most or all of the concepts and is able to apply them to defined laboratory experiments. Well written lab report.
$80 \geq C^{+} > 77 \geq C > 73 \geq C^{-} > 70$	Average, has a basic understanding of the major concepts of the course and is able to apply to basic experimental situations.
$70 \geq D^{+} > 67 \geq D > 63 \geq D^{-} > 60$	Below average, has a basic understanding of only the simple concepts and is able to apply to only a limited number of the most basic experiments.
$60 \geq F$	Demonstrates little to no understanding of the course content.

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 January 18; 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	January 11	**Introduction** **Lenses I**: Measurements of the optical power of a lens
2	January 18	**Lenses II**: Measurements of focal lengths of lenses
3	January 25	**Lenses III**: Newtonian and Gaussian lens equations
4	February 1	**Imaging I**: Object magnification and demagnification
5	February 8	**Imaging II**: Imaging with more than one lens, pupils and stops
6	February 15	**Imaging III**: Keplerian and Galilean telescopes
7	February 22	**Chromatic Aberrations**: Measurement of axial chromatic aberrations
8	March 1	**Polarization of Light**: Working principles of polarizers and waveplates
9	March 8	**Interference & Diffraction I**: Young's double-slit experiment
	March 15	**Formal Report I**: Prepare draft of formal report
10	March 22	**Interference & Diffraction II**: Apertures of various shapes
11	March 29	**Reflection Gratings**: The Littrow configuration
12	April 5	**Transmission Gratings**: Multi-slit interference
13	April 12	**Monochromatic aberrations**: Observation and mitigation of spherical aberrations
	April 19	**Formal Report II**: Revised formal report due

Course Requirements Cont.: Instructions for maintaining your laboratory notebook and report writing

This laboratory notebook contains all the experimental directions and spaces for your observations, results, tables, plots and responses to questions for each laboratory experiment you will conduct this semester. There is also space reserved to enter your informal lab notes. However, you should keep these notes in a neat and organized manner, so that your lab partners, and your lab instructor can easily follow what you have written, and (most importantly) so that you can come back later and read what you did long after you have forgotten the details. – As an engineer, keeping detailed notes that allow you or others to understand and reproduce your work will be a requirement of whatever job you have.

You will complete your lab notes in each class session and turn this lab book in for grading at the end of class. There is no other formal report required – just complete the lab notes section for each experiment fully and take good informal notes.

This lab book is also available online so that you can read ahead for future experiments if you wish.

One formal laboratory report will be required as the final examination for this laboratory course. A draft of this report will be due mid-semester. After receiving feedback on this draft, you can complete the report and turn it in by the date of the final examination.

How your laboratory notebook will be graded?

When you turn in your work, you should have answered all questions in a neat and clear manner.

- You should also be sure that your informal notes, experimental setup sketches table and plots are clear.
- Make sure you have taken and reported all required data and presented in in the manner asked for. If you choose to present the data in additional ways then you can do so, but you should state why. Be sure that all your error analysis is complete where appropriate.
- Explicitly answer all questions asked about the data, experimental method, etc.
- Ensure that you fully answered all of the discussion and analysis questions (those that require you to answer questions beyond your actual lab measurements). While your answer should have depth, they should also be concise – do not try to use long sentences to mask a lack of understanding. It is important that your answers are in complete, readable sentences.

For each laboratory, you will be graded according to the following rubric.

Item	**Maximum score (%)**	**Your Score**
Organization, neatness and readability of informal notes	25%	
Correctness and presentation of results (Including, where appropriate, tables, plots, error analysis)	35%	
Depth and conciseness of answers to Discussion and Analysis questions)	25%	
Responses in complete sentences and paragraphs.	15%	
Total	100%	

How your formal laboratory report will be graded?

In any field of science and engineering, once a significant amount of experimental work has been performed, the results of the work should be written up formally. Among other things, this could be in the form of a written report to you supervisors, or to a funding agency, or could be the results of new research that are submitted to a research journal for publication.

It is a requirement of this laboratory course that you take one of your assigned laboratory experiments and write this up in a formal report, in the style of a journal publication. You may choose which laboratory to write up, in conjunction with the lab instructor. You will use your own data and you may not select the same experiment as any of your lab partners.

The report should contain the following sections:

Abstract
Introduction
Experimental methods
Results
Discussion of results
Conclusions and recommendations for future experimental work.
References.

The following rubric will be used to grade your report: Each section will be weighted by a 5-point scale, poor (max points $\times\ 0$), fair (max points $\div\ 4$), good (max points $\div\ 2$), very good (max points $\times\ 3/4$), excellent (max points)

Max points	**Item**
5	**Title**
	Describes lab content concisely, adequately, appropriately
5	**Abstract**
	Conveys a sense of the full report concisely and effectively
10	**Introduction**
	Successfully establishes the context (concept/lab procedure) of the lab
	Effectively presents the objectives and purpose of the lab
	Presents interesting questions or issues related to the lab
15	**Experimental Methods**
	Gives enough details to allow for replication of procedure
	Lists equipment used and shows sketches where approriate
15	**Results**
	Opens with 1 or 2 sentence(s) describing main finding of lab
	Presents visuals clearly and accurately
	Presents verbal findings clearly and with sufficient support
	Successfully integrates verbal and visual representations

20	**Discussion of Results**
	Opens with explanation of how findings link to the context of lab
	Addresses questions & issues related to the lab & discusses the answers
	Sufficiently addresses other issues pertinent to lab
10	**Conclusions**
	Convincingly describes what has been learned by doing the lab
	Recommendations for future experimental work
10	**Presentation**
	Citations and references adhere to proper format
	Format of tables and figures is correct
	Report is written in scientific style: clear and to the point
	Grammar and spelling are correct
10	**Overall aims of the report:** *the student...*
	(a) accurately analyzes data of lab findings
	(b) has successfully learned what the lab is designed to teach
100	