UNIVERSITY OF CENTRAL FLORIDA

OSE 6265 - Optical Systems Design

Section: C001

Optics and Photonics

Course Information

Term: Summer 2025
Class Meeting Days: MW
Class Meeting Time: 06:00PM - 07:40PM
Class Meeting Location: BA1 O214
Modality: P
Credit Hours: 3

Instructor Information

Justin Woodruff
Title: Optical Systems Engineer
Office Location: TBD
Email: justin.woodruff@ucf.edu

Office Hours

On an as needed basis.

I will be happy to discuss the material with you over email, after class or schedule a meeting when possible.

Course Description

OSE 6265 OPT-OPT 3(3,0)Optical Systems Design: PR: Graduate Standing and OSE 5203 or C.I. Design principles of lens and mirror optical systems; evaluation of designs using computer techniques. Occasional.

This course is designed to provide a comprehensive foundation in design principles of optical systems, as well as the evaluation and optimization of designs using computer techniques. The lectures include an introduction to optical systems design, an introduction to the Zemax optical design software package, paraxial layout, raytracing, stops and pupils, lens design methods, optimization, achromatization, optical aberrations, and image quality metrics. Various classic lenses and optical systems will be studied using the theoretical and computing skills learned in class. Students will learn 1st and 3rd-order calculations, optical design code skills including optimization and image analysis, and optical design philosophy and practical skills.

Student Learning Outcomes

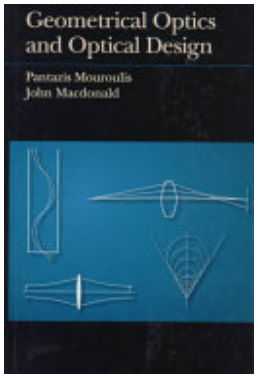
After successful completion of this course, students will be able to:

- Evaluate the performance for imaging optical system based on aberration theory.
- Understand common refractive and reflective optical instruments, design principle and performance evaluation criteria.
- Understand the major design constraints in manufacturing and properties in optical materials.
- Design basic optical systems using commercially available software (Zemax).

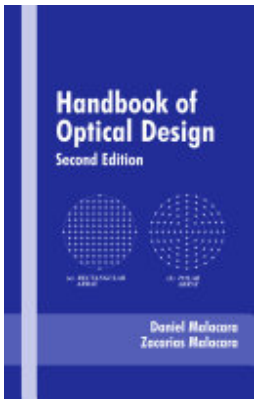
Required Course Materials and Resources

Introduction to Lens Design
ISBN: 9780943396750
Authors: Joseph M. Geary
Publication Date: 2002-01-01

Recommended Course Materials

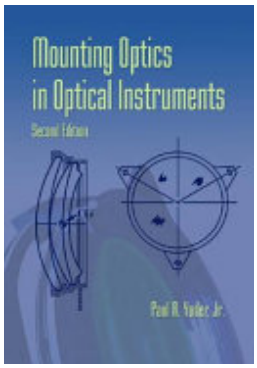


Title: Geometrical Optics and Optical Design
ISBN: 9780195089318
Authors: Pantazis Mouroulis, John Macdonald
Publisher: Oxford Series in Optical & Ima
Publication Date: 1997-01-01



Title: Handbook of Optical Design
ISBN: 9780203912942
Authors: Daniel Malacara-Hernández, Zacarías Malacara-Hernández
Publisher: CRC Press
Publication Date: 2003-09-21

Title: Mounting Optics in Optical Instruments
ISBN: 9780819471291
Authors: Paul R. Yoder
Publisher: SPIE Press
Publication Date: 2008-01-01



Course Assessment and Grading Procedure

This course contains 17 homework sets (subject to change), 1 midterm, and 1 final project. Students will be scored using a point-based grading system for each assignment. Homework, midterms and final projects are expected to be submitted via Webcourses.

Plus and minus grades will be used in the overall grade for the course.

Your final grade in the course will be based on (subject to change):

- Homework: 50%
- Midterm Project: 15%
- Final Project: 25%
- Participation: 10%

Grading Scale

Grading Scale (%)	**Rubric Description**
100 ≥ A ≥ 90	Excellent, has a strong understanding of all concepts and is able to apply the concepts in all and novel situations. Has full mastery of the content of the course.
90 > B ≥ 80	Good, has a strong understanding of most or all of the concepts and is able to

	apply them to stated and defined situations.
80 ˃ C ≥ 70	Average, has a basic understanding of the major concepts of the course and is able to apply to basic situations.
70 ˃ 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 situations.
60 ˃ F ≥ 0	Demonstrates no understanding of the course content.

Policies for Course Grade

Homework/Project Submission

Assignment Submission Assignments should be submitted through Webcourses@UCF. Upload a .zip file containing a document describing your design process and solution, as well as the associated code / Zemax files in your submission. Final Exam Student will work on a final optical design project (open book and notes) and due by the submission deadline.

Grade Objections

All objections to grades should be made in writing within one week after the due date of the work in question. Objections made after this period has elapsed will not be considered – NO EXCEPTIONS.

Missed/Late Assignments

If an emergency arises and a student cannot submit assigned work on or before the scheduled due date or cannot take an exam on the scheduled date, the student must give notification to the instructor no less than 24 hours before the scheduled date and no more than 48 hours after the scheduled due date.

Based on instructor discretion, assignments will be closed for submission 1 to 2 days after the submission deadline. Final grade for submissions will be reduced by 10% per day it is late.

Attendance

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 attendance verification by the end of the first week of classes, or as soon as possible after adding the course. Failure to do so will result in a delay in the disbursement of your financial aid.

Course Accessibility

The University of Central Florida is committed to providing access and inclusion for all persons with disabilities. Students with disabilities who need access to course content due to course design limitations should contact the professor as soon as possible. Students should also connect with Student Accessibility Services (SAS) (Ferrell Commons 185, sas@ucf.edu, phone 407-823-2371). For students connected with SAS, a Course Accessibility Letter may be created and sent to professors, which informs faculty of potential course access and accommodations that might be necessary and reasonable. Determining reasonable access and accommodations requires consideration of the course design, course learning objectives and the individual academic and course barriers experienced by the student. Further conversation with SAS, faculty and the student may be warranted to ensure an accessible course experience.

Academic Integrity

Students should familiarize themselves with UCF's Code of Conduct at Student Conduct and Integrity Office. According to Section 1, "Academic Misconduct," students are prohibited from engaging in:

a. Academic misconduct is defined as any submitted work or behavior that obstructs the instructor of record's ability to accurately assess the student's understanding or completion of the course materials or degree requirements (e.g., assignment, quiz, and/or exam). Examples of academic misconduct include but are not limited to: plagiarism, unauthorized assistance to complete an academic exercise; unauthorized communication with others during an examination, course assignment, or project; falsifying or misrepresenting academic work; providing misleading information to create a personal advantage to complete course/degree requirements; or multiple submission(s) of academic work without permission of the instructor of record.

b. Any student who knowingly helps another violate academic behavior standards is also in violation of the standards.
c. Commercial Use of Academic Material. Selling of course material to another person and/or uploading course material to a third-party vendor without authorization or without the express written permission of the University and the instructor of record. Course materials include but are not limited to class notes, the instructor of record's slide deck, tests, quizzes, labs, instruction sheets, homework, study guides, and handouts.
d. Soliciting assistance with academic coursework and/or degree requirements. The solicitation of assistance with an assignment, lab, quiz, test, paper, etc., without authorization of the instructor of record or designee is prohibited. This includes but is not limited to asking for answers to a quiz, trading answers, or offering to pay another to complete an assignment. It is considered Academic Misconduct to solicit assistance with academic coursework and/or degree requirements, even if the solicitation did not yield actual assistance (for example, if there was no response to the solicitation).

Responses to Academic Dishonesty, Plagiarism, or Cheating

Students should also familiarize themselves with the procedures for academic misconduct in UCF's student handbook, *The Golden Rule*. UCF faculty members have a responsibility for students' education and the value of a UCF degree, and so seek to prevent unethical behavior and respond to academic misconduct when necessary. Penalties for violating rules, policies, and instructions within this course can range from a zero on the exercise to an "F" letter grade in the course. In addition, an Academic Misconduct report could be filed with the Office of Student Conduct and Academic Integrity, which could lead to disciplinary warning, disciplinary probation, or deferred suspension or separation from the University through suspension, dismissal, or expulsion with the addition of a "Z" designation on one's transcript.

Being found in violation of academic conduct standards could result in a student having to disclose such behavior on a graduate school application, being removed from a leadership position within a student organization, the recipient of scholarships, participation in University activities such as study abroad, internships, etc.

Let's avoid all of this by demonstrating values of honesty, trust, and integrity. No grade is worth compromising your integrity and moving your moral compass. Stay true to doing the right thing: take the zero, not a shortcut.

Title IX

Title IX prohibits sex discrimination, including sexual misconduct, sexual violence, sexual harassment, and retaliation. If you or someone you know has been harassed or assaulted, you can find resources

available to support the victim, including confidential resources and information concerning reporting options at Let's Be Clear and UCF Cares.

For more information on access and community engagement, Title IX, accessibility, or UCF's complaint processes contact:

- Title IX – ONAC – Office of Nondiscrimination & Accommodations Compliance & askanadvocate@ucf.edu
- Disability Accommodation – Student Accessibility Services – Student Accessibility Services & sas@ucf.edu
- Access and Community Engagement (including the Ginsberg Center for Inclusion and Community Engagement, Military and Veteran Student Success, and HSI Initiatives)
- UCF Compliance and Ethics Office – Compliance, Ethics, and Risk Office & complianceandethics@ucf.edu
- The Ombuds Office is a safe place to discuss concerns.

Reporting an Incident or Issue

If you believe you have experienced abusive or discriminatory behavior by any faculty or staff member, contact the Office of Institutional Equity online or at 407-823-1336. You can also choose to report using the UCF Integrity Line and can report anonymously or as yourself at 1-855-877-6049 or using the online form. UCF cares about you and takes every report seriously. For more information see the Reporting an Incident or Issue Webpage.

Deployed Active-Duty Military Students

Students who are deployed active duty military and/or National Guard personnel and require accommodation should contact their instructors as soon as possible after the semester begins and/or after they receive notification of deployment to make related arrangements.

Campus Safety

At UCF Public Safety and Police, safety is the top priority. Emergencies on campus are rare, but if one should arise, it's important to be familiar with some basic safety and security concepts.

- In an emergency, always dial 911.
- Every UCF classroom has an **Emergency Procedure Guide** posted on a wall near the door, which will show you how to respond to a variety of situations. This guide can also be found

online here.

- In the event of an active threat, remember **AVOID, DENY, DEFEND**. Choose the best course of action and act immediately. Watch the video here to learn more.
    - **AVOID**. Pay attention to your surroundings and have an exit plan. Get as much distance and as many barriers between you and the threat as quickly as possible.
    - **DENY.** When avoiding is difficult or impossible, deny the threat access to you and your space. Lockdown by creating barriers, turning the lights off and remaining quiet and out of sight. Make sure your cell phone is silenced, but do not turn it off.
    - **DEFEND.** When you are unable to put distance between yourself and the threat, be prepared to protect yourself. Commit to your actions, be aggressive and do not fight fairly. Do whatever it takes to survive.
- For emergencies on campus, UCF will utilize the UCF Alert system. All UCF students, faculty and staff are automatically enrolled to receive these email and text alerts, however, it's a good idea to frequently ensure your contact information is up to date.

Financial Aid Accountability

All instructors/faculty are required to document students' academic activity at the beginning of each course. In order to document that you began this course, please complete this activity by the end of the first week of classes or as soon as possible after adding the course. Failure to do so may result in a delay in the disbursement of your financial aid.

Class Schedule

Subject to change, homework will be assigned once a week and due the following week unless specified by the instructor.

Week	Lecture	Topics Covered
1	1	Course introduction, Zemax introduction
	2	Sign Convention, paraxial raytracing, lens bending, aspheres.
2	3	Stops and pupils, aperture stop F/#, landscape lens
	4	Abberations, solves and merit function
3	5	Splitting a Lens/Zemax walk-through
	6	Spherical Abberation
4	7	Lens Bending and Abberation Balancing
	8	Symmetry and the Periscope lens
5	9	Coma and Astigmatism
	10	Field curvature and field flattening
6	11	Distortion, axial color and achromats
	12	Bending achromats
7	13	Secondary color
	14	Large air-spaced achromat and french landscape lens
8	15	Midterm takehome
	16	Apochromat
9	17	Eyepiece deign
	18	Field lens and windows
10	19	Mirrors, corrector plates, symmetric achromate and vignetting
	20	Telescopes, Celor lens
11	21	Triplet lens, Strehl ratio
	22	Dept of focus and resolution
12	23	MTF, Final exam

Grade Dissemination

Grades for all the assignments (homework, midterm, final project) will be posted on Webcourses@UCF.