



UNIVERSITY OF  
CENTRAL FLORIDA

## OSE 4240 - Introduction to Optical Design

**Section: 0001**

*Optics and Photonics*

### Course Information

---

**Term:** Spring 2026

**Class Meeting Days:** TR

**Class Meeting Time:** 06:00PM - 07:15PM

**Class Meeting Location:** CROLA214

**Modality:** P

**Credit Hours:** 3.00

### Instructor Information

---

**Name:** Dr. Robert Grimming

**Title:** Adjunct Professor

**Office Location:** CREOL, A316

**Office Hours**

Scheduled by Email

**Email:** robert.grimming@ucf.edu

### Course Description

---

OSE 4240 OPT-OPT 3(3, 0) Introduction to Optical Design: PR: OSE3200 and OSE 3052. Introduction of the main concepts in optical system design. Discussion on

aberration theory. Analysis of the performance of the optical system. Assessment of image quality using optical design software. Spring

### Detailed Description

Analysis and design of imaging optical systems consisting of lenses, mirrors, and apertures. Topics include image plane formation, principal planes, entrance and exit pupils, magnification, field of view, F-number, and image-plane irradiance. Image quality is assessed using diffraction-based and geometrical metrics, including point-spread function (PSF) and modulation transfer function (MTF), with emphasis on understanding the impact of aberrations (spherical, coma, astigmatism, field curvature, distortion, and chromatic effects).

Students will use optical design software (e.g., Zemax OpticStudio) to build, analyze, and optimize simple imaging systems, explore basic tolerance sensitivity, and complete a small end-to-end design project. As time permits, the course will also briefly survey modern photonic and integrated-optic systems and illustrate how similar modeling ideas extend to waveguides and related components.

### Student Learning Outcomes

---

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

- **Apply first-order and ray-tracing methods** to analyze and sanity-check imaging systems consisting of lenses, mirrors, and apertures.
- **Describe primary monochromatic and chromatic aberrations** and interpret ray fans, spot diagrams, and related plots to assess their impact on image quality.
- **Evaluate the performance of an imaging system** using diffraction-based and geometrical metrics, including PSF/OTF/MTF, and relate these metrics to system requirements and detector sampling.
- **Explain the structure and design roles of common lens-based imaging instruments and classic lens forms** (e.g., camera objectives, telescopes, landscape and double-Gauss lenses).

- **Design and analyze simple imaging optical systems using industry software** (e.g., Zemax OpticStudio), including basic setup, optimization, and interpretation of key analysis plots, culminating in a small end-to-end design project.
- **Recognize major practical constraints that influence lens design**, including optical material properties, coatings and throughput, approximate fabrication tolerances, and the impact of element count and layout on performance.

## Required Course Materials and Resources

---

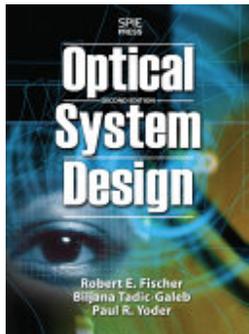
### Ansyz Zemax OpticStudio Student

**Notes:** We will use Ansys Zemax OpticStudio Student (free student edition) for all software-based labs and the final design project. Ansys Zemax OpticStudio Student is available as a free download from Ansys for students and provides access to imaging-system design tools.

**Online Access:** <https://www.ansys.com/academic/students/ansys-student>

## Recommended Course Materials

---



**Title:** Optical System Design, Second Edition

**ISBN:** 9780071593588

**Authors:** Robert F. Fischer

**Publisher:** McGraw Hill Professional

**Publication Date:** 2008-02-17

*image  
not  
available*

**Title:** Introduction to Lens Design

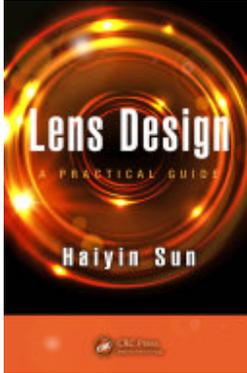
**Subtitle:** With Practical Zemax Examples

**ISBN:** 9780943396750

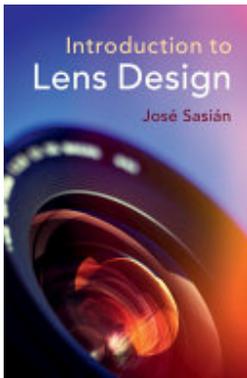
**Authors:** Joseph M. Geary

**Publisher:** Willmann-Bell

**Publication Date:** 2002-01-01



**Title:** Lens Design  
**ISBN:** 9781138455702  
**Authors:** Haiyin Sun  
**Publisher:** CRC Press  
**Publication Date:** 2016-12-19



**Title:** Introduction to Lens Design  
**ISBN:** 9781108494328  
**Authors:** José Sasián  
**Publisher:** Cambridge University Press  
**Publication Date:** 2019-09-26

## Course Assessment and Grading Procedure

---

Student performance in OSE 4240 will be assessed using a combination of exams, software-based design labs, homework/quizzes, a final design project, and in-class participation.

### Midterm Exam (25%)

One in-class midterm exam will cover material from the first half of the course, including geometric optics review, cardinal points, stops and pupils, aberrations, and basic image quality metrics (PSF/MTF). The midterm emphasizes conceptual understanding and core calculations rather than Zemax details.

### Homework / Concept Quizzes (20%)

Short written homework sets and/or online quizzes will reinforce key concepts (paraxial imaging, aberrations, MTF, chromatic effects, classic forms, etc.). Not every lecture will have a homework assignment, but work will be assigned regularly throughout the semester. Some quizzes may be administered in class or via Webcourses.

### **Zemax Labs (25%)**

There will be **three** graded software labs using Ansys Zemax OpticStudio (Student version):

- **Lab 1:** Paraxial → real model (build and analyze a simple imaging system).
- **Lab 2:** Optimization in practice (apply variables, a merit function, and interpret before/after performance).
- **Lab 3:** Tolerancing sensitivity (run sensitivity tolerancing and identify critical parameters).

Each lab will be submitted as a short report (figures + answers to guiding questions). Labs are weighted approximately equally within the 25%.

### **Final Design Project (25%)**

The final project is an end-to-end lens design exercise completed in Zemax:

- Turn a use case into specifications (EFL, F/#, FOV, sensor, working distance).
- Choose or adapt a starting form.
- Perform basic optimization and analyze aberrations/MTF.
- Provide a concise written report and a short in-class presentation.

Project grading will be based on technical correctness, appropriate use of design tools, clarity of analysis/plots, and quality of communication (report and presentation).

### **Participation / In-Class Exercises (5%)**

Participation credit will be based on:

- Attendance and engagement in lecture.
- Completion of in-class worksheets, activities, and ungraded problem-solving sessions.
- Constructive contributions during review sessions and project studio days.

Students can earn full credit with regular attendance and reasonable engagement; this is not meant to be punitive for occasional absences.

## Assignment Schedule

---

Due Date	Assignment Name	Assignment Type	Points
	<a href="#">Group Capstone Project(Draft)</a>	Assignment	100
	<a href="#">Roll Call Attendance</a>	Assignment	5
1/13/26	<a href="#">Day 1 Assignment - UCF Required Participation</a>	Quiz	5
1/15/26	<a href="#">Geo Optics Mini-Quiz (Pre-Class)</a>	Quiz	5
1/22/26	<a href="#">Matrix Optics Mini-Quiz (After-Class)</a>	Quiz	5
1/25/26	<a href="#">Homework #1 - The Optometry Clinic</a>	Quiz	25
2/3/26	<a href="#">Aberrations Mini-Quiz I</a>	Quiz	5
2/12/26	<a href="#">Homework #2 - Aberrations</a>	Quiz	25
2/22/26	<a href="#">Homework #3 - First Pass Lens Design</a>	Quiz	25

## Grading Scale

---

Grading Scale

Letter Grade	Percentage
A	94-100%
A-	90-93%
B+	87-89%

Letter Grade	Percentage
B	84-86%
B-	80-83%
C+	77-79%
C	74-76%
C-	70-73%
D+	67-69%
D	64-66%
D-	61-63%
F	0-60%

## Policies for Course Grade

---

### Makeup Work Policy

- Make-up exams or quizzes will be granted only for documented, excused absences (illness, family emergency, official university activity, etc.).
- When possible, students should contact the instructor before the scheduled exam/quiz time to arrange a make-up.

### Missed/Late Assignments

- Work is due at the time/date posted on Webcourses.
- Late submissions will incur a 10% per day deduction for up to 5 days, and then no credit.

### Attendance

- Regular attendance and active participation are expected in this course. Many in-class examples, short exercises, and project studio activities are difficult to make up from notes alone.
- Occasional absences for illness, interviews, or other unavoidable conflicts are understood; however, repeated unexcused absences or chronic lateness will reduce your participation score.

- If you anticipate missing an exam, lab session, or graded in-class activity due to illness, family emergency, or official university activity, contact the instructor as early as possible.

## **Artificial Intelligence (AI) Use Policy**

---

Generative AI tools may be used as a study aid, but not to do your graded work unless I explicitly say so.

### **Allowed (with disclosure):**

- Reviewing background material (thin-lens equation, ABCD matrices, aberrations, etc.)
- Getting alternative explanations or practice questions
- Light editing of your writing (grammar/wording only)

If you use AI for a graded written assignment in these limited ways, add a brief note such as:

*"I used [Tool Name] to help with grammar/wording."*

### **Not allowed (unless explicitly permitted):**

- Solving or outlining solutions to homework problems
- Designing, optimizing, or analyzing lenses for Zemax labs or the final project
- Generating substantial portions of lab/project reports or presentations
- Any assistance on quizzes, the midterm, or any exam

Submitting AI-generated work as your own without permission and disclosure is considered academic misconduct under UCF policy and may result in a zero on the assignment and referral to the Office of Student Conduct.

**When in doubt, ask before using AI on an assignment.**

## Disability Access & Accommodations

---

The University of Central Florida is committed to providing equal access to all students with disabilities (ADHD, learning disabilities, Autism, chronic medical conditions, physical disabilities, etc.). To receive consideration for reasonable disability-related course accommodations, disabled students must contact Student Accessibility Services (SAS) and complete the steps required for SAS to review accommodation requests. More information can be found on the UCF [Student Accessibility Services](#) website under the Start Here tab or by contacting SAS directly (Ferrell Commons 185; [sas@ucf.edu](mailto:sas@ucf.edu); Phone - 407-823-2371).

Approved accommodations are shared with course instructors via the SAS Course Accessibility Letter. Implementing certain accommodations may require discussion about specific considerations of the course design, course learning objectives, and the individual academic and course challenges experienced by the student. While students with disabilities or chronic health needs are also encouraged to discuss any course concerns with professors in addition to contacting SAS, professors are not required to facilitate disability-related adjustments to the course unless the professor has received a Course Accessibility Letter from SAS that outlines approved accommodations.

## 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:

1. 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 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 assessment, 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.

2. Any student who knowingly helps another violate academic behavior standards is also in violation of the standards.
3. 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 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.
4. 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" designated 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](mailto:askanadvocate@ucf.edu)
- Disability Accommodation – Student Accessibility Services – [Student Accessibility Services](#) & [sas@ucf.edu](mailto: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](mailto:complianceandethics@ucf.edu)
- The [Ombuds Office](#) is a safe place to discuss concerns.

## Reporting an Incident or Issue

---

If you believe you have experienced discrimination by any faculty or staff member, contact the Office of Nondiscrimination & Accommodations Compliance via the [ONAC website](#) or at 407-823-1336. You can also choose to report using the UCF

Integrity Line either anonymously or as yourself at 1-855-877-6049 or by 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 arrangements.

## Campus Safety

---

At UCF's 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 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 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

---

Course Schedule

Class	Topic
1 (Jan 13)	Course Intro & Big Picture
2 (Jan 15)	Geometric Optics Refresh
3 (Jan 20)	Matrix Optics & Cardinal Points
4 (Jan 22)	Stops, Pupils, F/#, Field of View
5 (Jan 27)	Cardinal Points Recap & Transition to Aberrations
6 (Jan 29)	Aberration Theory I
7 (Feb 3)	Aberration Theory II
8 (Feb 5)	Aberration Theory III
9 (Feb 10)	Image Quality Metrics: PSF, OTF, MTF
10 (Feb 12)	System MTF & Detector Coupling
11 (Feb 17)	Chromatic Aberration & Achromats
12 (Feb 19)	Thin-Lens Design Techniques
13 (Feb 24)	Wollaston/Landscape & Simple Objectives
14 (Feb 26)	Classic Forms: Double-Gauss & Others
15 (Mar 3)	Review & Synthesis
16 (Mar 5)	Midterm Exam
17 (Mar 10)	Introduction to Lens Design Software (Zemax)
18 (Mar 12)	Lab 1: From Paraxial to Real Model
	Spring Break (Mar 16-21)

<b>Class</b>	<b>Topic</b>
19 (Mar 24)	Design Workflow & Requirements
20 (Mar 26)	Optimization Basics
21 (Mar 31)	Lab 2: Optimization in Practice
22 (Apr 2)	Optical Materials & Glass Selection
23 (Apr 7)	Coatings & Throughput
24 (Apr 9)	Lab 3: Tolerancing I - Sensitivity
25 (Apr 14)	Tolerancing II: Monte Carlo & Manufacturability
26 (Apr 16)	Stray Light & Ghosts
27 (Apr 21)	System-Level Case Study
28 (Apr 23)	Project Studio / Troubleshooting
29 (April 28)	UCF Study Day (No-Classes)
TBD	Project Presentations (Final Exam Slot between April 29 and May 5)