

# Course Syllabus

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## OSE 3200: Geometric Optics

CREOL - The College of Optics and Photonics

3 Credit Hours

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### Instructor Information

- Instructor: Prof. Stephen S. Eikenberry
- Office Location: CREOL A120
- Office Hours: Tues/Thu 3-4PM
- Digital Contact: [Stephen.Eikenberry@ucf.edu](mailto:Stephen.Eikenberry@ucf.edu)

### Course Information

- Term: Fall 2022
- Course Number & Section: OSE 3200
- Course Name: Geometric Optics
- Credit Hours: 3
- Class Meeting Days: Mondays and Wednesdays
- Class Meeting Time: 4:30-5:45 PM
- Class Location: CREOL 102
- Course Modality: In person
- Course Attribute (if applicable): N/A

# Enrollment Requirements

Course Prerequisites: You must have completed PHY 2049C (Physics for Engineers 2) and other courses required for entry into the Photonic Science and Engineering major.

## Course Description

Fundamentals of geometrical optics. Geometrical theory of image formation. Chromatic and monochromatic aberrations. Optical systems.

## Course Purpose

Geometric optics is the study of light in its simplest form by treating light as rays. Light rays travel in straight lines until they encounter an interface (such as a mirror or a lens) where they may be redirected by reflection and refraction. This course describes the physical principles that determine how rays behave at various interfaces. We then use these principles to model simple optical systems with varying degrees of fidelity. We analyze natural optical phenomena (mirages, total-internal reflection, rainbows, etc.) and classic optical systems (prisms, telescopes, cameras, etc.) throughout the course. This course provides the fundamentals needed for optical engineering and optical system design.

## Course Materials and Resources

### Required Materials/Resources

- E. Dereniak and T. Dereniak, "Geometrical and Trigonometrical Optics" (textbook available on-line)
- Class notes

## Student Learning Outcomes

Upon completion of this course, students should understand the representation of light paths using rays. They should understand how light propagates through “most” optical systems – where “most” refers to optical systems that are not affected by the wave nature of light. They should be able to analyze simple optical systems such as telescopes, imagers, luminaires and concentrators. For example, students should be able to:

- Determine the behavior of a ray (reflection/refraction angles and amplitudes) at any optical surface.
- Recognize and identify the fundamental features of geometrical optics as found in optical systems
- Analyze the key performance properties and design features of optical systems using geometric optics approaches
- Calculate spot diagrams, encircled energy, MTF, and other performance parameters using optics software packages (i.e. ZEMAX)
- Design an imaging system with a desired resolution, field-of-view and magnification.

- Identify fundamental limits and aberrations in an optical system.

## Course Activities

The course activities include:

- Weekly Assignments, including readings, quizzes and practice problems.
- Mid-term and Final Examinations
- Extra Credit is NOT offered for this course.
- Students should plan on at least five hours' worth of homework outside of class each week.

## Activity Submissions

All assignments will be posted on [Webcourses@UCF](mailto:Webcourses@UCF), (<mailto:Webcourses@UCF>) and submission through [Webcourses@UCF](mailto:Webcourses@UCF) (<mailto:Webcourses@UCF>) is required, except for in-class quizzes and exams.

## Attendance/Participation

Attendance to the classroom sessions is expected, and participation comprises 10% of the overall course grade.

## Make-up Exams and Assignments

Per university policy, you are allowed to submit make-up work (or an equivalent, alternate assignment) for authorized university-sponsored activities, religious observances, or legal obligations (such as jury duty). If this participation conflicts with your course assignments, I will offer a reasonable opportunity for you to complete missed assignments and/or exams. The make-up assignment and grading scale will be equivalent to the missed assignment and its grading scale. In the case of an authorized university activity, it is your responsibility to show me a signed copy of the Program Verification Form for which you will be absent, prior to the class in which the absence occurs. In any of these cases, please contact me ahead of time to notify me of upcoming needs.

## Assessment and Grading Procedures

The table shows the weight distribution for each assignment.

Assignment	Percentage of Grade
Participation	10%
Quizzes	15%

Homework	25%
Midterm Exam	25%
Final Exam	25%
Total	100%

The table shows the range for each letter grade and uses a plus/minus system.

<b>Letter Grade</b>	<b>Points</b>
A	93 – 100 points
A-	90 – 92 points
B+	87 – 89 points
B	83 – 86 points
B-	80 – 82 points
C+	77 – 79 points
C	73 – 76 points
C-	70 – 72 points
D+	67 – 69 points
D	63 – 66 points
D-	60 – 62 points
F	59 and below

Consult the latest Undergraduate or Graduate [catalog](http://catalog.ucf.edu/) [\\_\(http://catalog.ucf.edu/\)\\_](http://catalog.ucf.edu/) for regulations and procedures regarding grading such as Incomplete grades, grade changes, and grade forgiveness.

## Course Schedule

**Topics: (A detailed schedule with dates is linked below)**

- Introduction to Geometric Optics – Light as Rays: Wave nature of light, propagation in homogeneous media, wavefronts and rays, radiometry, limits of geometrical optics.
- Planar Optical Surfaces: Refractive index, optical path length, Fermat's principle, Snell's law, reflection and refraction, plane parallel plates, prisms, optical materials.
- Curved Optical Surfaces: Image formation, lenses, optical spaces, image types, shape of optical surfaces, ray tracing, paraxial approximation.
- Imaging: Lens design, thin lens model, magnification, ZZ' diagram, cardinal points, Gaussian optics, thick lenses, mirrors.
- Apertures: Aperture stop, field stop, F-number, numerical aperture, depth of focus.
- Aberrations: Diffraction limit, chromatic and monochromatic aberrations.

*Schedule (coming soon)*

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## University Services and Resources

### Academic Services and Resources

A list of available academic support and learning services is available at [UCF Student Services](https://www.ucf.edu/services/) [\(https://www.ucf.edu/services/\)](https://www.ucf.edu/services/). Click on "Academic Support and Learning Services" on the right-hand side to filter.

### Non-Academic Services and Resources

A list of non-academic support and services is also available at [UCF Student Services](https://www.ucf.edu/services/) [\(https://www.ucf.edu/services/\)](https://www.ucf.edu/services/). Click on "Support" on the right-hand side to filter.

If you are a UCF Online student, please consult the [UCF Online Student Guidelines](https://www.ucf.edu/online/resources/guidelines/) [\(https://www.ucf.edu/online/resources/guidelines/\)](https://www.ucf.edu/online/resources/guidelines/) for more information about your access to non-academic services.

## Policy Statements

## In-Class Recording Statement

Students may, without prior notice, record video or audio of a class lecture for a class in which the student is enrolled for their own personal educational use. A class lecture is defined as a formal or methodical oral presentation as part of a university course intended to present information or teach enrolled students about a particular subject. Recording class activities other than class lectures, including but not limited to lab sessions, student presentations (whether individually or part of a group), class discussion (except when incidental to and incorporated within a class lecture), clinical presentations such as patient history, academic exercises involving student participation, test or examination administrations, field trips, private conversations between students in the class or between a student and the faculty member, and invited guest speakers is prohibited. Recordings may not be used as a substitute for class participation and class attendance, and may not be published or shared without the written consent of the faculty member. Failure to adhere to these requirements may constitute a violation of the University's Student Code of Conduct as described in the Golden Rule.

## Academic Integrity

Students should familiarize themselves with UCF's [Rules of Conduct](https://scai.sdes.ucf.edu/student-rules-of-conduct/) (<https://scai.sdes.ucf.edu/student-rules-of-conduct/>). According to Section 1, "Academic Misconduct," students are prohibited from engaging in:

- *Unauthorized assistance*: Using or attempting to use unauthorized materials, information or study aids in any academic exercise unless specifically authorized by the instructor of record. The unauthorized possession of examination or course-related material also constitutes cheating.
- *Communication to another through written, visual, electronic, or oral means*: The presentation of material which has not been studied or learned, but rather was obtained through someone else's efforts and used as part of an examination, course assignment, or project.
- *Commercial Use of Academic Material*: Selling of course material to another person, student, and/or uploading course material to a third-party vendor without authorization or without the express written permission of the university and the instructor. Course materials include but are not limited to class notes, Instructor's PowerPoints, course syllabi, tests, quizzes, labs, instruction sheets, homework, study guides, handouts, etc.
- *Falsifying or misrepresenting* the student's own academic work.
- *Plagiarism*: Using or appropriating another's work without any indication of the source, thereby attempting to convey the impression that such work is the student's own.
- *Multiple Submissions*: Submitting the same academic work for credit more than once without the express written permission of the instructor.
- *Helping another violate* academic behavior standards.

For more information about Academic Integrity, students may consult [The Center for Academic Integrity](https://academicintegrity.org/) (<https://academicintegrity.org/>).

For more information about plagiarism and misuse of sources, see “[Defining and Avoiding Plagiarism: The WPA Statement on Best Practices](http://wpacouncil.org/node/9)” (<http://wpacouncil.org/node/9>).

## 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](https://goldenrule.sdes.ucf.edu/wp-content/uploads/sites/64/2019/09/2019-2020-Golden-Rule.pdf) (<https://goldenrule.sdes.ucf.edu/wp-content/uploads/sites/64/2019/09/2019-2020-Golden-Rule.pdf>). UCF faculty members have a responsibility for students’ education and the value of a UCF degree, and so seek to prevent unethical behavior and when necessary respond to academic misconduct. Penalties can include a failing grade in an assignment or in the course, suspension or expulsion from the university, and/or a "Z Designation" on a student’s official transcript indicating academic dishonesty, where the final grade for this course will be preceded by the letter Z. For more information about the Z Designation, see <http://goldenrule.sdes.ucf.edu/zgrade> (<http://goldenrule.sdes.ucf.edu/zgrade>).

## Course Accessibility Statement

The University of Central Florida is committed to providing access and inclusion for all persons with disabilities. This syllabus is available in alternate formats upon request. Students with disabilities who need specific access in this course, such as accommodations, should contact the professor as soon as possible to discuss various access options. Students should also connect with [Student Accessibility Services](http://sas.sdes.ucf.edu) (<http://sas.sdes.ucf.edu>) (Ferrell Commons, 7F, Room 185, [sas@ucf.edu](mailto:sas@ucf.edu) (<mailto:sas@ucf.edu>), phone (407) 823-2371). Through Student Accessibility Services, a Course Accessibility Letter may be created and sent to professors, which informs faculty of potential access and accommodations that might be reasonable.

## Campus Safety Statement

Emergencies on campus are rare, but if one should arise during class, everyone needs to work together. Students should be aware of their surroundings and familiar with some basic safety and security concepts.

- In case of an emergency, dial 911 for assistance.
- Every UCF classroom contains an emergency procedure guide posted on a wall near the door. Students should make a note of the guide’s physical location and review the online version at <https://centralflorida-prod.modolabs.net/student/safety/index> (<https://centralflorida-prod.modolabs.net/student/safety/index>).
- Students should know the evacuation routes from each of their classrooms and have a plan for finding safety in case of an emergency.
- If there is a medical emergency during class, students may need to access a first-aid kit or AED (Automated External Defibrillator). To learn where those are located, see <https://ehs.ucf.edu/automated-external-defibrillator-aed-locations> (<https://ehs.ucf.edu/automated-external-defibrillator-aed-locations>).

- To stay informed about emergency situations, students can sign up to receive UCF text alerts by going to <<https://my.ucf.edu> (<<https://my.ucf.edu/>>) and logging in. Click on “Student Self Service” located on the left side of the screen in the toolbar, scroll down to the blue “Personal Information” heading on the Student Center screen, click on “UCF Alert”, fill out the information, including e-mail address, cell phone number, and cell phone provider, click “Apply” to save the changes, and then click “OK.”
- Students with special needs related to emergency situations should speak with their instructors outside of class.
- To learn about how to manage an active-shooter situation on campus or elsewhere, consider viewing this video (<  
<https://youtu.be/NIKYajEx4pk> (<<https://youtu.be/NIKYajEx4pk>



(<<https://youtu.be/NIKYajEx4pk>

>).

## Make-Up Policy

## Deployed Active Duty Military

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.

## Make-Up Assignments for Authorized University Events or Co-curricular Activities

Students who represent the university in an authorized event or activity (for example, student-athletes) and who are unable to meet a course deadline due to a conflict with that event must provide the instructor with documentation in advance to arrange a make-up. No penalty will be applied. For more information, see the UCF policy at <<https://policies.ucf.edu/documents/4-401.pdf> (<<https://policies.ucf.edu/documents/4-401.pdf>>

## Religious Observances

Students must notify their instructor in advance if they intend to miss class for a religious observance. For more information, see the UCF policy at

< <http://regulations.ucf.edu/chapter5/documents/5.020ReligiousObservancesFINALJan19.pdf>>

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## Copyright



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## Third-Party Software and FERPA

During this course you might have the opportunity to use public online services and/or software applications sometimes called third-party software such as a blog or wiki. While some of these could be required assignments, you need not make any personally identifying information on a public site. Do not post or provide any private information about yourself or your classmates. Where appropriate you may use a pseudonym or nickname. Some written assignments posted publicly may require personal reflection/comments, but the assignments will not require you to disclose any personally identity-sensitive information. If you have any concerns about this, please contact your instructor.

## Course Summary:

Date	Details	Due
	 <a href="https://webcourses.ucf.edu/courses/1412890/assignments/7630777">Module 1 Feedback Survey: Introduction to Geometrical Optics</a> <a href="https://webcourses.ucf.edu/courses/1412890/assignments/7630777">https://webcourses.ucf.edu/courses/1412890/assignments/7630777</a>	
	 <a href="https://webcourses.ucf.edu/courses/1412890/assignments/7630781">Module 1 Short Quiz</a> <a href="https://webcourses.ucf.edu/courses/1412890/assignments/7630781">https://webcourses.ucf.edu/courses/1412890/assignments/7630781</a>	
	 <a href="https://webcourses.ucf.edu/courses/1412890/assignments/7630779">Module 2 Short Quiz</a> <a href="https://webcourses.ucf.edu/courses/1412890/assignments/7630779">https://webcourses.ucf.edu/courses/1412890/assignments/7630779</a>	
	 <a href="https://webcourses.ucf.edu/courses/1412890/assignments/7630778">Module 3 Short Quiz</a> <a href="https://webcourses.ucf.edu/courses/1412890/assignments/7630778">https://webcourses.ucf.edu/courses/1412890/assignments/7630778</a>	
	 <a href="https://webcourses.ucf.edu/courses/1412890/assignments/7630776">Quiz Example</a> <a href="https://webcourses.ucf.edu/courses/1412890/assignments/7630776">https://webcourses.ucf.edu/courses/1412890/assignments/7630776</a>	

Date	Details	Due
	 <a href="https://webcourses.ucf.edu/courses/1412890/assignments/7630775">Quiz Example 2</a> ( <a href="https://webcourses.ucf.edu/courses/1412890/assignments/7630775">https://webcourses.ucf.edu/courses/1412890/assignments/7630775</a> )	
	 <a href="https://webcourses.ucf.edu/courses/1412890/assignments/7630780">Syllabus Quiz</a> ( <a href="https://webcourses.ucf.edu/courses/1412890/assignments/7630780">https://webcourses.ucf.edu/courses/1412890/assignments/7630780</a> )	