



UNIVERSITY OF
CENTRAL FLORIDA

OSE 5203 - Geometrical Optics

Section: 0001

Optics and Photonics

Course Information

Term: Spring 2025

Class Meeting Days: TR

Class Meeting Time: 01:30PM - 02:45PM

Class Meeting Location: CROL A214

Modality: P

Credit Hours: 3.00

Combined Section Information

This syllabus applies to sections OSE 5203 0001, OSE 5203 0V02.

Instructor Information



Stephen Eikenberry

Office Location: CREOL A120

Office Hours:

Wed 1:30-2:30; Thurs 3:30-4:30

Email: Stephen.Eikenberry@ucf.edu

Course Description

OSE 5203 OPT-OPT 3(3,0)Geometrical Optics : PR: Admitted to a graduate program in Optics, Physics or Electrical Engineering, or C.I. Fundamentals of Geometrical Optics, Geometrical Theory of Image Formation and Aberrations. Fall, Spring.

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 Materials and Resources

P. Mouroulis and J. MacDonald, “Geometrical Optics and Optical Design” Oxford University Press 1997.

Course Assessment and Grading Procedure

The course activities include:

- Weekly Assignments, including readings, quizzes and practice problems.
- Mid-term and Final Examinations
- A Final Project analyzing the performance characteristic of an imaging system in ZEMAX
- Extra Credit is NOT offered for this course.
- Students should plan on at least five hours' worth of homework outside of class each week.

The table shows the weight distribution for each assignment.

Assignment	Percentage of Grade
Final Project	25%
Quizzes	10%
Homework	15%
Midterm Exam	25%
Final Exam	25%
Total	100%

Grading Scale

Letter Grade	Percentage
A	93-100%
A-	90-92%
B+	87-89%
B	83-86%
B-	80-82%
C+	77-79%

Letter Grade	Percentage
C	73-76%
C-	70-72%
D+	67-69%
D	63-66%
D-	61-62%
F	0-60%

Policies for Course Grade

Makeup Work 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>>

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>>

Missed/Late 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.

Attendance

Attendance to the classroom sessions is expected for the in-person section(s).

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 diversity and inclusion, Title IX, accessibility, or UCF’s complaint processes contact:

- Title IX – OIE – [Office of Institutional Equity](#) & 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

Week	Topic
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	

Week	Topic
15	
16	

Week

Starts

Concepts Presented:

Book¹ chapter

HW²

Assessment

1

1/7

Module 1: Ray description of light fields, radiant flux, solid angle, collection efficiency

1

Syllabus Quiz

2

1/8

Module 2: Refractive index, optical path length, reflection and refraction, Fresnel coefficients, Fermat's principle, total internal reflection

1

2

Quiz 1

Rays, Power

3

1/21

Module 3: plane parallel plates, mirrors and prisms, optical materials and dispersion

2

3

Quiz 2

Refraction

4

1/28

Module 4: Thin lenses, lens shapes, lens-maker's equation, sequential imaging

3

4

Quiz 3

Prisms

5

2/4

Module 5: Curved Mirrors

Ray-tracing (manual; ZEMAX)

3,4

5

Quiz 4

Lenses

6

2/11

Combinations of thin-lenses, Gullstrand's equation, principle points; Thick lenses, cardinal points,

4

6

Quiz 5 Mirrors

7

2/18

Review; Midterm

7

2/25

Apertures: stops and pupils, diffraction limit, F-number, resolution, depth of focus/field;

Ray trace worksheets, chief and marginal rays, scaling

Characterize paraxial properties from a ray trace, vignetting

5

7

Quiz 6 Combination

8

3/4

Lens systems; Aberrations (Chromatic)

6

8

9

3/11

Aberrations; More optical systems

6

8

Quiz 7

Thick Lenses

3/18

SPRING BREAK

10

3/25

Aberrations of real systems; Semester project79Quiz 8 Chromatic

11

4/1

More on real aberrations; semester project

7, 8

10

Quiz 9 Apertures

12

4/8

Quiz catch-up; Semester project

9

11

Quiz 10

Aberrations

13

4/15

Final Review & Exam

4/29

Semester Project Due