



UNIVERSITY OF  
CENTRAL FLORIDA

# OSE 6115 - INTERFERENCE AND DIFFRACTION

**Section: 0001**

*Optics and Photonics*

## Course Information

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**Term:** Fall 2025

**Class Meeting Days:** TR

**Class Meeting Time:** 10:30AM - 11:45AM

**Class Meeting Location:** CROL 0102

**Modality:** P

**Credit Hours:** 3.00

## Instructor Information

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**Name:** Eric Johnson

**Title:** Professor

**Office Location:** CREOL 213

**Office Hours**

TBD

**Email:** Eric.Johnson2@ucf.edu

## Course Description

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OSE 6115 OPTIC-OPTICS 3(3,0)Interference and Diffraction: PR: Graduate Standing or C.I. Interference of light, optical interferometry, Fraunhofer and Fresnel scalar diffraction, diffraction gratings, temporal coherence, spatial coherence, and partial coherence.

## Course content:

### 1. Review and Fundamentals

- a. Time-harmonic form of Maxwell's equations.
- b. Transverse Electromagnetic waves and plane wave properties.
- c. Fourier Analysis and Linear Systems.

### 1. Wave interference

- a. Angular spectrum of plane waves.
- b. Wavefronts and Optical path differences.
- c. Spherical waves and point sources.
- d. Multi-beam interference.

### 2. Diffraction

- a. Propagation and the Rayleigh-Sommerfeld Diffraction.
- b. Fresnel diffraction.
- c. Fraunhofer diffraction.
- d. Babinet's principle, Poisson's spot, and the Talbot effect.
- e. Asymptotic transforms, singularities, and approximations.

### 3. Interferometry

- a. Division of amplitude and division of wavefront.
- b. Fizeau, Newton, Lloyd, Michelson, Mach-Zehnder, and Sagnac interferometers.
- c. Multiple beam interferometers, Fabry-Perot, and periodic structures.
- d. Extended incoherent sources.
- e. Optical test methods.
- f. Interferometric imaging.
- g. Phase shifting, heterodyning, time-delay, and applications.

### 4. Elements of coherence

- a. Temporal and spatial coherence.
- b. Van Cittert-Zernike Theorem.
- c. Stochastic processes and the Wiener-Khinchin Theorem.
- d. Fourier transform spectroscopy.

## Student Learning Outcomes

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

- Apply wave optics principles to analyze interference phenomena, including optical interferometry, and evaluate the role of temporal and spatial coherence in system performance.
- Distinguish and model scalar diffraction regimes, specifically Fraunhofer and Fresnel diffraction, and predict light behavior through apertures and obstacles using appropriate mathematical frameworks.

## **Required Course Materials and Resources**

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### **Course notes**

## **Course Assessment and Grading Procedure**

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Course Grading:

Exam I 25%

Exam II 25%

Final 30%

Homework 10%

Project 10%

Total 100%

### **Homework (10%)**

Homework will be assigned throughout the semester and will be primarily used to augment the information contained in the lectures. Students can work together but must submit their own work for grading. No late homework will be accepted without consent of the instructor through a prior arrangement before the due date.

### **Exams (25%, 25%)**

Exams will be closed book exams. The students can bring a single 8.5 by 11 inch sheet with appropriate notes, equations, or constants with the front and backside for reference. No make-up exams will be permitted without consent of the instructor through a prior arrangement before the exam date.

### Final (30%)

The Final Exam will be closed book. The students can bring a single 8.5 by 11 inch sheet with appropriate notes, equations, or constants with the front and backside for reference. No make-up exams will be permitted without consent of the instructor through a prior arrangement before the exam date.

### Class Project (10%):

Topic must be related to the subject matter covered during the course and must include the following as part of the 5 pages:

- A minimum of 3 technical references – refereed journals and/or relevant patents, which must be appropriately referenced. (3%)
- Explanation of key aspects and how they connect to the topic(s) associated with interference and diffraction. (3%)
- Discussion of the state of the art in the related topic area and what are the advantages and/or benefits and/or applications of this topic. (4%)

## Assignment Schedule

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Due Date	Assignment Name	Assignment Type	Points
	<a href="#">Exam I</a>	Assignment	100
8/22/25	<a href="#">Assignment 0</a>	Assignment	0
9/24/25	<a href="#">Homework 1</a>	Assignment	0
11/4/25	<a href="#">Homework II</a>	Assignment	100
11/12/25	<a href="#">Exam II</a>	Assignment	100
11/30/25	<a href="#">Class Project</a>	Assignment	100
12/2/25	<a href="#">Exam III</a>	Assignment	100

## Grading Scale

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Grading Scale

<b>Letter Grade</b>	<b>Percentage</b>
A	94-100%
A-	90-93%
B+	87-89%
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**

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### **Makeup Work Policy**

All makeup work must be coordinated with the instructor.

### **Missed/Late Assignments**

No late assignments will be accepted unless coordinated with the instructor prior to the submission date.

### **Attendance**

Attendance is not required; however, students are responsible for material presented and will not be provided after lecture has been completed.

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

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AI may be used to augment the learning process; however, homework assignments must be completed by the student and if AI is used, then it should be clearly stated as such.

## **Disability Access & Accommodations**

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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**

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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 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.

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" 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

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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

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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

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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

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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 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

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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

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Transverse Electromagnetic waves and plane wave properties. 8/21  
Fourier analysis and linear systems. 8/26

Angular spectrum of plane waves. 8/28  
Wavefronts and Optical path differences. 9/2, 9/4  
Spherical and other scalar waves. 9/9  
Multi-beam interference. 9/11

Propagation and the Rayleigh-Sommerfeld Diffraction. 9/16, 9/18  
Fresnel diffraction approximation. 9/23  
Fraunhofer diffraction. 9/25  
Babinet's principle, Poisson's spot, and the Talbot effect. 9/30

### **Exam I Oct. 2**

Asymptotic transforms, singularities, and approximations. 10/7  
Division of amplitude and division of wavefront. 10/9  
Fizeau, Newton, Lloyd, Michelson, Mach-Zehnder, and Sagnac. 10/14, 10/16  
Multiple beam interferometers. 10/21, 10/23  
Extended incoherent sources. 10/28  
Optical test methods. 10/30  
Interferometric imaging. 11/4

### **Exam II Nov. 6**

Holiday 11/11

Phase shifting, heterodyning, time-delay, and applications. 11/13

Temporal and spatial coherence. 11/18

Van Cittert-Zernike Theorem. 11/20

Wiener-Khinchin Theorem. 11/25

**Final Exam TBD**