



UNIVERSITY OF
CENTRAL FLORIDA

OSE 3053 - Electromagnetic Waves for Photonics

Section: 0001

Optics and Photonics

Course Information

Term: Fall 2024

Class Meeting Days: MW

Class Meeting Time: 13:45 - 15:00

Class Meeting Location: CROL 0102

Modality: P

Credit Hours: 3.00

Instructor Information

Andrea Blanco Redondo

Title: Professor of Optics & Photonics

Office Location: CREOL 210

Office Hours:

M,W, 3:15 pm - 4:15 pm

Email: Andrea@creol.ucf.edu

Course Description

OSE 3053 OPTIC 3(3,0)Electromagnetic Waves for Photonics: PR: C (2.0 GPA) or higher in OSE 3052 Electromagnetic theory of light. Fresnel reflection and refraction. Polarization and crystal optics. Metallic and dielectric waveguides. Fall, Spring

Student Learning Outcomes

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

- Explain the concept of electromagnetic (EM) fields.
- Use Maxwell's equations in time domain and frequency domain (time-harmonic EM waves).
- Apply Maxwell's equations to determine the electric and the magnetic fields and the power carried by an EM wave, and their dependence on the electromagnetic properties of the medium in which they propagate.
- Analyze the propagation characteristics of plane waves including the propagation constants, electric and magnetic fields, and power flow.
- Determine the polarization state of a given field.
- Analyze the reflection and transmission of light waves at planar interfaces and the dependence on the incident wave polarization and angle of incidence.
- Analyze the reflection/transmission from a single film on a substrate. Application: design a thin film antireflective (AR) coating.
- Explain the principles of crystal optics and wave propagation in anisotropic media. Application: analyze simple components that control the polarization and the intensity of light.
- Explain the principles of waveguides and perform modal analysis for a given waveguide (determine the guided modes). Application: optical fibers, photonic integrated circuits.

Course Assessment and Grading Procedure

- Problem sets: 25%
 - Problem sets are to be submitted before the beginning of the class on the due date by e-mail.
 - Late homework will not be accepted.
 - You may work with others but the submission must be all yours.
- Midterm Exam I: 20%
- Midterm Exam II: 20%
- Final Exam: 35%

Assignment Schedule

Due Date	Assignment Name	Assignment Type	Points
8/23	Course pretest - Academic Engagement Activity	Quiz	2
9/4	Homework 1	Assignment	5

Grading Scale

Letter Grade	Percentage
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

Missed exams/Late Assignments

- Assignments must be submitted before the beginning of the class on the due date by e-mail.
- Late assignments will not be accepted.
- If an emergency arises and a student cannot submit assigned work by the due date or cannot take an exam on the scheduled date, the student must notify the

instructor as soon as possible.

- Extenuating circumstances may be considered case-by-case.

Makeup Work Policy

- If the student timely notifies the instructor of an emergency/extenuating circumstances AND if the instructor considers the circumstances to be truly mitigating, the instructor may decide to allow for the student to take the exam on a different date or to submit an assignment past the due date.

Attendance

- Regular class attendance is necessary for students to fully grasp the course concepts.
- If you miss a class session, it will be your responsibility to find out the materials that were covered.
- The instructor will not answer questions about topics covered in lectures not attended by the student. (Extenuating circumstances may be considered case by case)

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.

Reporting an Incident or Issue

If you believe you have experienced abusive or discriminatory behavior by any faculty of 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](#).

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.

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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	Vector Analysis (VA)
2	VA, Electromagnetic (EM) Fields

Week	Topic
3	EM Fields
4	Maxwell Equations
5	Linear Systems, Time-Harmonic Maxwell Equations
6	MIDTERM I , Plane EM Waves
7	Plane EM Waves, Polarization
8	Boundary conditions, Plane Wavefield Matching
9	Plane Wave Refraction and Reflection
10	Multilayer Refraction and Reflection
11	Wave Propagation in Anisotropic Media
12	MIDTERM II , Crystal Optics
13	Crystal Optics
14	Introduction to Waveguides, Dielectric Waveguides
15	Dielectric Waveguides, Review
16	FINAL