UNIVERSITY OF CENTRAL FLORIDA

OSE 3053 - Electromagnetic Waves for Photonics

Section: 0001

Optics and Photonics

Course Information

Term: Spring 2024
Class Meeting Days: MW
Class Meeting Time: 15:00 - 16:15
Class Meeting Location: ENG1 O224
Modality: P
Credit Hours: 3.00

Instructor Information

Dr. Midya Parto
Title: Assistant Professor of Optics
Office Location: A215
Office Hours:
Wednesdays 16:30-18
Email: midya.parto@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. Spring

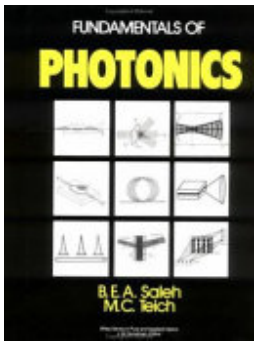
Student Learning Outcomes

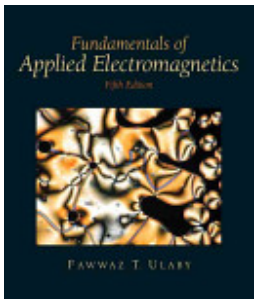
After successful completion of this course, students will learn to:

- 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.

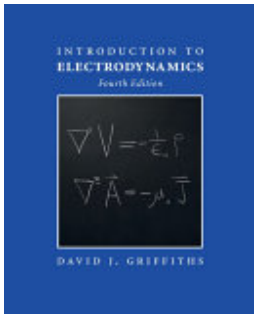
Course Materials and Resources

Fundamentals of Photonics
Authors: Bahaa E. A. Saleh, Malvin Carl Teich
Publisher: Wiley-Interscience
Publication Date: 1991-08-29





Fundamentals of Applied Electromagnetics
ISBN: 9780132371384
Authors: Fawwaz Tayssir Ulaby
Publisher: Prentice Hall
Publication Date: 2007-01-01



Introduction to Electrodynamics
ISBN: 9781108420419
Authors: David J. Griffiths
Publisher: Cambridge University Press
Publication Date: 2017-06-29

Course Assessment and Grading Procedure

- Problem sets: 25%
  - Problem sets are to be submitted before the beginning of the class on the due date in person or by e-mail.
  - Late homework is not accepted.
  - You may work with others but the submission must be all yours.
- Midterm Exam I: 20%
- Midterm Exam II: 25%
- Final Exam: 30%

Exams are comprehensive and are closed book and notes.

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-	51-63%
F	0-50%

Policies for Course Grade

Makeup Work/Exam Policy

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 no less than 24 hours before and no more than 48 hours after the scheduled 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.

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 Rules of Conduct at Student Conduct and Integrity Office. According to Section 1, "Academic Misconduct," students are prohibited from engaging in:

1. 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.
2. Communication to another through written, visual, electronic, or oral mans: The presentation of material which has not been studied or learned, but rather obtained through someone else's efforts and used as part of an examination, course assignment, or project.
3. 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.
4. Falsifying or misrepresenting the student's own academic work.
5. 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.

6. Multiple Submissions: Submitting the same academic work for credit more than once without the express written permission of the instructor.
7. Helping another violate academic behavior standards.
8. Soliciting assistance with academic coursework and/or degree requirements.

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, 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
- Diversity and Inclusion Training and Events – Office of the VP for Diversity, Equity & Inclusion
- UCF Compliance and Ethics Office – Compliance, Ethics, and Risk Office & complianceandethics@ucf.edu
- The Ombuds Office is a safe place to discuss concerns.

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

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 Safety
- 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 AED Locations.

- To stay informed about emergency situations, students can sign up to receive UCF text alerts by going to RAVE Mobile Safety and logging in. On the “My Account” tab, fill out the information, including e-mail address and cell phone number.
- 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 from the UCF Police Department, You CAN Survive an Active Shooter.

Campus Safety Statement for Students in Online-Only Courses

Though most emergency situations are primarily relevant to courses that meet in person, such incidents can also impact online students, either when they are on or near campus to participate in other courses or activities or when their course work is affected by off-campus emergencies. The following policies apply to courses in online modalities.

- To stay informed about emergency situations, students can sign up to receive UCF text alerts by going to RAVE Mobile Security and logging in. On the “My Account” tab, fill out the information, including e-mail address and cell phone number.
- Students with special needs related to emergency situations should speak with their instructor outside of class.

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

2	Vector Analysis, EM Fields
3	Maxwell's Equations
4	Linear Systems, Time-Harmonic Maxwell's Equations, **MidTerm I**
5	MidTerm I Solutions, EM Waves
6	Plane Waves, State of Polarization, Boundary Conditions
7	Plane Wave Reflection/Transmission
8	Plane Wave Reflection/Transmission, Multi-layer Reflection/Transmission (AR Coating)
9	Wave Propagation in Anisotropic Media, **MidTerm II**
10	**Spring Break**
11	MidTerm II Solutions, Crystal Optics
12	Introduction to Waveguides
13	Metallic Waveguides
14	Dielectric Waveguides
15	Review + Problem Solving
16	**Final**