COURSE SYLLABUS
OSE 3052 FOUNDATIONS OF PHOTONICS, SPRING 2021

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Term: Spring 2021
Class Days: Monday and Wednesdays
Class Time: 9:00 - 10:15 AM
Class Location: Global building 0324

Office Hours: Thursday: 1:00 PM – 2:00 PM (before discussion).
I will be happy to discuss the course material with you anytime by appointment.

Class Notes: This is a BlendFlex modality course, the class will be split into two groups that meet physical distancing requirements in the assigned classroom. You will only be permitted to attend one in-person class meeting per week. All other students are expected to attend virtually (Zoom meetings) at designated days and times as specified in the class meeting pattern.

- When not in a physical class, you will "attend" the equivalent of the weekly instruction remotely synchronously (Zoom).
- **You cannot choose which day to attend in person**; your only option is your assigned cohort day.
- A real-time video feed and/or a recording of each class session will be available to those students not in the classroom on a given day.

Instruction may be supplemented by additional online activity, projects, or exams.
Internet access, browser, and e-mail required. Webcams and microphones may be required for class meetings and may be required for exams.

I. University Course Catalog Description

Introduction to wave and photon models of light. Interference and diffraction of light. Polarization. LEDs and Lasers as generators of photons. Detectors of photons.

II. Course Overview

Introduction:

Some of the main growth areas in the "high-tech" sectors are centered on the branch of optics known as "Photonics", examples are; displays, data storage, telecommunication systems. This is not a temporary phenomenon. Continued growth of optics and photonics based industries means that there will be a growing and permanent need for engineers and scientists with some training in optics. Other areas of optics, such as bio-photonics, laser machining, laser marking, infrared imaging, etc. are growing strongly also. These topics are covered in the other courses in the Photonic Science and Engineering degree program. This course provides students with the strong foundation in optics that will be needed for the subsequent courses. We will frequently make reference to applications as we go.

Content:

This course introduces the basic descriptions of light as waves (physical optics), and photons.
Interference of optical waves is described along with interferometers and their applications to optical metrology and sensing. Fourier series for the analysis of waves. Diffraction of optical waves propagating through apertures is examined and the effects on the resolution of imaging systems and the spreading and focusing of optical beams are covered. Diffraction gratings and grating spectrometers. Introduction to Fourier analysis for treating diffraction. Brief introduction to polarization and polarization devices. Regarding light as photons, a brief introduction to absorption, emission, and luminescence phenomena is followed by a brief description of photonic devices such as light emitting diodes, lasers and optical detectors.

The more advanced electromagnetic properties of light are mostly postponed to the next course in the sequence: OSE 3053 Electromagnetic Waves for Photonics.

III. Course Learning Objectives

Upon completion of this course, students should understand the basic principles of modern physical optics and photonics. They should be able to read the specifications of commercial optical instruments such as a scanner for a laser printer, or a spectrometer, and determine how these specifications impact the intended application. They should also be able to solve analysis and design problems for basic optical systems such as the following examples:

- Determine the changes in the Young's double-slit interference pattern that result from bringing the slits closer by some factor.
- Determine the changes in the Michelson interferogram that result from moving one of the mirrors or inserting a thin glass slab in one of the arms.

IV. Course Prerequisites

MAP 2302 Differential Equations.

V. Credits

3

VI. Course Textbook

Optics, 5th ed., Eugene Hecht, Pearson, 2016.

Reference (Optional) Books

Introduction to Optics, 3rd ed., F. L. Pedrotti, L.S. Pedrotti and L. M. Pedrotti, Prentice-Hall, 2009

Schaum's Outline of Theory and Problems of Optics, Eugene Hecht, McGraw Hill, 1975.

Fundamentals of Photonics, 2nd edition B. Saleh and M. Teich, Wiley, 2007

VII. Course Requirements

- The student is expected to review the textbook and other materials before class. Materials used for class will be available on UCF Webcourses
- Occasionally you may be required to a take short quiz during class
- You are required to attend class
- Internet access, browser and e-mail
- Webcam and microphone will be required for class meetings and may be required for exams

VIII. Course Grading

Grading Scale (%)	Rubric Description
$100 \geq A > 93 \geq A^{-} > 90$	Excellent, has a strong understanding of all concepts and is able to apply the concepts in all and novel situations. Has full mastery of the content of the course.
$90 \geq B^{+} > 87 \geq B > 83 \geq B^{-}$	Good, has a strong understanding of most or all of the concepts and is able to apply them to stated and defined situations.
$80 \geq C^{+} > 77 \geq C > 73 \geq C^{-}$	Average, has a basic understanding of the major concepts of the course and is able to apply to basic situations.

$70 \geq D^{+} > 67 \geq D > 63 \geq D^{-}$	Below average, has a basic understanding of only the simple concepts and is able to apply to only a limited number of the most basic situations.
$60 \geq F$	Demonstrates little to no understanding of the course content.

Course Item	Percent of Final Grade
Homework	10%
Two mid-term exams (20% each)	40%
Quizzes	20%
Final exam	30%
	100%

IX. Grading Objections

All objections to grades should be made IN WRITING WITHIN ONE WEEK of the work in question. Objections made after this period has elapsed will NOT be considered – NO EXCEPTIONS.

X. Professionalism and Ethics

Academic dishonesty in any form will not be tolerated. If you are uncertain as to what constitutes academic dishonesty, please consult The Golden Rule, the University of Central Florida's Student Handbook (http://www.goldenrule.sdes.ucf.edu/) for further details. As in all University courses, The Golden Rule Rules of Conduct will be applied. Violations of these rules will result in a record of the infraction being placed in your file and the student receiving a zero on the work in question AT A MINIMUM. At the instructor's discretion, you may also receive a failing grade for the course. Confirmation of such incidents can also result in expulsion from the University.

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XI. Students with Special Testing/Learning Needs

Students with special needs and require special accommodations must be registered with UCF Student Disability Services prior to receiving those accommodations. Students must have documented disabilities requiring the special accommodations and must meet with the instructor to discuss the special needs as early as possible in the first week of classes. UCF Student Disability Services can be contacted at http://www.sds.sdes.ucf.edu/, or at (407) 823-2371.

XII. Excusal from Course Assignments and Course Examinations

If an emergency arises and a student cannot submit assigned work on or before the scheduled due date or cannot take an exam on the scheduled date, the student MUST give notification to the instructor NO LESS THAN 24 HOURS BEFORE the scheduled date and NO MORE THAN 48 HOURS AFTER the scheduled date.

XIV. Statement Regarding COVID-19

University-Wide Face Covering Policy for Common Spaces and Face-to-Face Classes

To protect members of our community, everyone is required to wear a facial covering inside all

common spaces including classrooms:
(https://policies.ucf.edu/documents/PolicyEmergencyCOVIDReturnPolicy.pdf.

Students who choose not to wear facial coverings will be asked to leave the classroom by the instructor. If they refuse to leave the classroom or put on a facial covering, they may be considered disruptive (please see the Golden Rule for student behavior expectations). Faculty have the right to cancel class if the safety and well-being of class members are in jeopardy. Students will be responsible for the material that would have been covered in class as provided by the instructor.

Notifications in Case of Changes to Course Modality

Depending on the course of the pandemic during the semester, the university may make changes to the way classes are offered. If that happens, please look for announcements or messages in Webcourses@UCF or Knights email about changes specific to this course.

COVID-19 and Illness Notification

Students who believe they may have a COVID-19 diagnosis should contact UCF Student Health Services (407-823-2509) so proper contact tracing procedures can take place.

Students should not come to campus if they are ill, are experiencing any symptoms of COVID-19, have tested positive for COVID, or if anyone living in their residence has tested positive or is sick with COVID-19 symptoms. CDC guidance for COVID-19 symptoms is located here: (https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html)

Students should contact their instructor(s) as soon as possible if they miss class for any illness reason to discuss reasonable adjustments that might need to be made. When possible, students should contact their instructor(s) before missing class.

In Case of Faculty Illness

If the instructor falls ill during the semester, there may be changes to this course, including having a backup instructor take over the course. Please look for announcements or mail in Webcourses@UCF or Knights email for any alterations to this course.

Course Accessibility and Disability COVID-19 Supplemental Statement

Accommodations may need to be added or adjusted should this course shift from an on-campus to a remote format. Students with disabilities should speak with their instructor and should contact sas@ucf.edu to discuss specific accommodations for this or other courses.

Because of the continued remote instruction requirements due to the COVID-19 pandemic, this course will use Zoom for some synchronous ("real time") class meetings. Meeting dates and times will be scheduled through Webcourses@UCF and should appear on your calendar.

Please take the time to familiarize yourself with Zoom by visiting the UCF Zoom Guides at <https://cdl.ucf.edu/support/webcourses/zoom/>. You may choose to use Zoom on your mobile device (phone or tablet).

Things to Know About Zoom:

- You must sign in to my Zoom session using your UCF NID and password.
- The Zoom sessions are recorded.
- Improper classroom behavior is not tolerated within Zoom sessions and may result in a referral to the Office of Student Conduct.
- You can contact Webcourses@UCF Support at <https://cdl.ucf.edu/support/webcourses/> if you have any technical issues accessing Zoom.

XIII. Class Attendance and Participation

- Regular class attendance is mandatory.
- Please be on time to class.
- Come to class prepared.

Note: The instructor reserves the right to modify the information contained in this document at his discretion.

COURSE SCHEDULE

	Topic
1	Instructor Introduction; Course Overview (ALL)
2	Wave Motion / Fourier Series
3	Photons and Light
4	The Superposition of Waves
5	Polarization
6	Interference
7	Diffraction / Fourier Analysis
8	Lasers and LEDs
9	Photodetectors

Note: The dates of the topics will be posted on Webcourses and are subject to change depending upon how things progress during the course of the semester