

COURSE SYLLABUS

YEAR COURSE OFFERED: 2021

SEMESTER COURSE OFFERED: Fall

DEPARTMENT: ECE

COURSE NUMBER: 16186/16187

NAME OF COURSE: ECE 5358/6358: Modern Optics and Photonics
<http://courses.egr.uh.edu/ECE/ECE5358/Web/welcome.htm>

NAME OF INSTRUCTOR: Dr. Han Le *ece6358@gmail.com*

Due to the changing nature of the COVID-19 pandemic, please note that the instructor may need to make modifications to the course syllabus and may do so at any time. Notice of such changes will be announced as quickly as possible through e-mail.

Learning Objectives

- To provide students, as a part of breadth of knowledge, with understanding of modern optics and contemporary photonics to prepare them for a professional career.
- To provide students a basic working knowledge of modern optics and contemporary photonics so that students can apply and teach themselves necessary knowledge should they encounter technical problems and technologies related to optics, optoelectronics, and photonics in their professional careers.
- To provide a solid foundation for advanced undergraduates who may seek graduate programs (MS, PhD) with aspects involving modern optics and photonics.

Expected course outcomes are:

1. Students will gain an ability to apply knowledge of mathematics, science, and engineering, specifically in the areas of optics, optoelectronics, and photonics [ABET Program Outcome (a)].
2. Students will gain an ability to identify, formulate, and solve engineering problems by learning concepts and techniques such as S-matrix for boundary condition problems, integro-differential solutions, Fourier transform. [ABET Program Outcome (e)].
3. Students will gain an ability to communicate effectively in doing a teamwork presentation on selected topics [ABET Program Outcome (g)].
4. Students will gain the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context [ABET Program Outcome (h)], as well as a knowledge of contemporary issues [ABET Program Outcome (j)] by learning the impact of optics, optoelectronics, and photonics in telecommunication, Internet, optical data storage, display, metrology, sensor technologies, renewable energy (solar cells), and energy efficiency such as lighting, laser spark for combustion engine.

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- Students will gain an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice by using computation software such as Mathematica® to solve problems with symbolic manipulation as well as numerical computation and graphic presentation [ABET Program Outcome (k)].

Major Assignments/Exams

Quizzes	15-35%
Homework	5-35%
Exams	20-40%
Group presentation	0-25%

Required Reading

None

Required Software

Wolfram Mathematica: free to UH students (go to <https://uh.edu/software-downloads/>)

Recommended Reading

- Introduction to Modern Optics, Grant R. Fowles, Dover Publications, ISBN-10: 0486659577
- Optoelectronics and Photonics: Principles and Practices, Safa O. Kasap, Prentice Hall, ISBN-10: 0201610876.
- Fundamentals of Photonics, Bahaa E. A. Saleh and Malvin V. Teich, Wiley-Interscience, ISBN-10: 0471358320.

List of discussion/lecture topics

Course topics:

Set 1	The Propagation of light
Set 2	Gaussian beams
Set 3	Polarization
Set 4	Planar interface and stratified media - Thin films
Set 5	Planar waveguides and optical fibers
Set 6	Light propagation – temporal - pulses
Set 7	Coherence and interference
Set 8	Diffraction and Scattering
Set 9	Introduction of Fourier Optics and Lens Imaging
Set 10	Review of the Quantum Theory
Set 11	Lasers and LEDs
Set 12	Photodetection: detectors, noise, detection techniques.
Set 13	Advanced topic: introduction to photonics (modulators, amplifiers, switches, couplers, WDM, photonics integrated circuits.)
Set 14	Advanced topics: system applications: optical communications
Set 15	Advanced topics: system applications: optical data storage, display,

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	spectroscopy, metrology and sensing.
Set 16	Selected topics for project and presentation: contemporary technologies and applications

Pre-requisites:

ECE 3317. For transferred students, ECE-3317-equivalent undergraduate electricity and magnetism, or Junior-level undergraduate optics.

Covid-19 information

Students are encouraged to visit the [University's COVID-19 website](#) for important information including on-campus testing, vaccines, diagnosis and symptom protocols, campus cleaning and safety practices, report forms, and positive cases on campus. Please check the website throughout the semester for updates.

Vaccinations

Data suggests that vaccination remains the best intervention for reliable protection against COVID-19. Students are asked to familiarize themselves with pertinent [vaccine information](#), consult with their health care provider. The University strongly encourages all students, faculty and staff to be vaccinated.

Reasonable Academic Adjustments/Auxiliary Aids

The University of Houston complies with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, pertaining to the provision of reasonable academic adjustments/auxiliary aids for disabled students. In accordance with Section 504 and ADA guidelines, UH strives to provide reasonable academic adjustments/auxiliary aids to students who request and require them. If you believe that you have a disability requiring an academic adjustments/auxiliary aid, please contact [the Justin Dart Jr. Student Accessibility Center](#) (formerly the Justin Dart, Jr. Center for Students with DisABILITIES).

Excused Absence Policy

Regular class attendance, participation, and engagement in coursework are important contributors to student success. Absences may be excused as provided in the University of Houston [Undergraduate Excused Absence Policy](#) and [Graduate Excused Absence Policy](#) for reasons including: medical illness of student or close relative, death of a close family member, legal or government proceeding that a student is obligated to attend, recognized professional and educational activities where the student is presenting, and University-sponsored activity or athletic competition. Under these policies, students with excused absences will be provided with an opportunity to make up any quiz, exam or other work that contributes to the course grade or a satisfactory alternative. Please read the full policy for details regarding reasons for excused absences, the approval process, and extended absences. Additional policies address absences related to [military service](#), [religious holy days](#), [pregnancy and related conditions](#), and [disability](#).

Face Covering Policy

To reduce the spread of COVID-19, the University strongly encourages everyone (vaccinated or not) to wear face coverings indoors on campus including classrooms for both faculty and students.

Presence in Class

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Your presence in class each session means that you:

- Are NOT exhibiting any [Coronavirus Symptoms](#) that makes you think that you may have COVID-19
- Have NOT tested positive or been diagnosed for COVID-19
- Have NOT knowingly been exposed to someone with COVID-19 or suspected/presumed COVID-19

If you are experiencing any COVID-19 symptoms that are not clearly related to a pre-existing medical condition, do not come to class. Please see [Student Protocols](#) for what to do if you experience symptoms and [Potential Exposure to Coronavirus](#) for what to do if you have potentially been exposed to COVID-19. Consult the (select: [Undergraduate Excused Absence Policy](#) or [Graduate Excused Absence Policy](#)) for information regarding excused absences due to medical reasons.

Recording of Class

Students may not record all or part of class, livestream all or part of class, or make/distribute screen captures, without advanced written consent of the instructor. If you have or think you may have a disability such that you need to record class-related activities, please contact the [Justin Dart, Jr. Student Accessibility Center](#). If you have an accommodation to record class-related activities, those recordings may not be shared with any other student, whether in this course or not, or with any other person or on any other platform. Classes may be recorded by the instructor. Students may use instructor's recordings for their own studying and notetaking. Instructor's recordings are not authorized to be shared with *anyone* without the prior written approval of the instructor. Failure to comply with requirements regarding recordings will result in a disciplinary referral to the Dean of Students Office and may result in disciplinary action.

Online instructional activities and learning

Resources for Online Learning

The University of Houston is committed to student success, and provides information to optimize the online learning experience through our [Power-On](#) website. Please visit this website for a comprehensive set of resources, tools, and tips including: obtaining access to the internet, AccessUH, and Blackboard; requesting a laptop through the Laptop Loaner Program; using your smartphone as a webcam; and downloading Microsoft Office 365 at no cost. For questions or assistance contact UHOnline@uh.edu.

UH Email

Please check and use your Cougarnet email for communications related to this course. To access this email, [login](#) to your Microsoft 365 account with your Cougarnet credentials.

Webcams

Access to a webcam is required for students participating remotely in this course. Webcams must be turned on during the class and the final exam (if necessary).

Honor Code Statement

Students may be asked to sign an honor code statement as part of their submission of any graded work including but not limited to projects, quizzes, and exams: *"I understand and agree to abide by the provisions in the [University of Houston Undergraduate Academic Honesty Policy](#), [University of Houston](#)*

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[Graduate Academic Honesty Policy](#). I understand that academic honesty is taken very seriously and, in the cases of violations, penalties may include suspension or expulsion from the University of Houston."

Helpful Information

Coogs Care: <https://www.uh.edu/dsaes/coogscare/>

Laptop Checkout Requests: <https://www.uh.edu/infotech/about/planning/off-campus/index.php#do-you-need-a-laptop>

Student Health Center: <https://uh.edu/class/english/lcc/current-students/student-health-center/index.php>