



**COURSE TITLE/SECTION:** Physics 3312 Modern Optics/Class Number 23649

**TIME:** 1 pm – 2:30 pm MW

**LOCATION:** SR#1 606

**FACULTY:** Dr. Donna Stokes

**OFFICE HOURS:** 2:30 – 3:30 pm MW and by appointment  
Science and Research #1, Rm. 531-C

**E-mail:** dstokes@uh.edu

**Phone:** (713) 743-3588

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## I. Course: 3312 Modern Optics

**A. Catalog Description:** Geometric optics, optical instruments, electromagnetic waves, interference, diffraction, polarization, lasers, holography, Fourier transform optics, and nonlinear optics.

**B. Prerequisites:** Prerequisites: [PHYS 1322](#) or, with consent of instructor, [PHYS 1302](#) and [MATH 2433](#)

**II. Course Objectives:** The goal is to review and develop fundamental principles and concepts in classical optics, and optical and quantum electrodynamics.

**III. Course Structure:** The web address for the class is [www.uh.edu/~dwstokes](http://www.uh.edu/~dwstokes).

**IV. Course Content:** This course will cover chapters 1-13 which include the following topical areas:

1. Geometric Optics: Refraction, reflection, matrix formulation of reflection and refraction, thin lenses, mirrors, prisms, optical fibers, thick lenses, analytical ray tracing, aberrations and optical systems design. (Chapters 4-6 of textbook)
2. Physical Optics: Waves, superposition principle, electromagnetic theory of optics, interference and interferometry, Fraunhofer and Fresnel diffraction and polarization. (Chapters 2-4, and 7-10 of textbook)
3. Modern Optics: Wave theory of image formation, optical applications of Fourier transforms, holography, introduction to coherence theory, nonlinear optics, modern optical devices and introduction to the ideas of quantum electrodynamics. (Chapters 11-13 of textbook)

**V. Textbook:** Optics, 4<sup>th</sup> Edition, *by Eugene Hecht*.

**Note:** It is highly recommended that you have access to some mathematical assistance tool such as Maple, Mathcad, Matlab, Mathematica or Derive.

## VI. Course Requirements

**Written Assignments:** 6-10 **homework** problems will be assigned each week and will be due approximately one week from that date. Late homework is only accepted with a valid excuse.

**Quizzes/Attendance:** Unannounced, in class quizzes will be given throughout the semester. Quizzes will take no more than 10 minutes and will include 1-3 questions/problems related to the topics covered. The quizzes will count for 10% of your final grade. There are no makeup quizzes.

**Exams:** There will be three **regular exams** and a **final exam** for a total of four exams for the class. The **regular exams** will be given during class. Each regular exam will be worth 15 % of your final grade for a total of 45% for the three regular exams. The **final exam** will be comprehensive covering all chapters covered for the course. The format of the final exam will be similar to that of a regular exam. This exam will be given during the University scheduled time. The final exam will be worth 25% of your final grade

## VII. Evaluation and Grading

20%	<b>Homework</b>
10%	<b>In Class Quizzes/Take Home exercises</b>
15%	<b>Regular Exam I</b>
15%	<b>Optical Systems Presentation</b>
15%	<b>Regular Exam II</b>
25%	<b>Final Exam (May13th, 2 pm – 5 pm and SR#1 room 606)</b>

**Policy on grades of I (Incomplete):** The temporary grade of I (incomplete) is a conditional and temporary grade given when students (a) are currently passing a course or (b) still have a reasonable chance of passing in the judgment of the instructor, but for non-academic reasons beyond their control have not completed a relatively small part of all requirements. Incompletes will be given only when documentation has been submitted to support the need to receive an incomplete, i.e., medical statements.

**VIII. Consultation:** My office is located in room 531-C of Science and Research #1. My mailbox is located in the Physic office, room 617 in Science and Research # 1. My office hours will be from 2:30 pm –3:30 pm on Mondays and Wednesdays.

**IX. References:** Introduction to Optics by Pedrotti,  
Fundamentals of Optics, 4<sup>th</sup> Edition, by Jenkins and White  
Introduction to Modern Optics, 2<sup>nd</sup> Edition, by Fowles

**Addendum:** Whenever possible, and in accordance with 504/ADA guidelines, the University of Houston will attempt to provide reasonable academic accommodations to students who request and require them. Please call 713-743-5400 for more assistance.

**Academic Honesty:** It is each student's responsibility to read and understand the Academic Honesty Policy found at <http://catalog.uh.edu/content.php?catoid=6&navoid=1025>.

**Religious Holy Days:** Students whose religious beliefs prohibit class attendance or the completion of specific assignments on designated dates may obtain an excused absence. To do so, please make a written request for an excused absence and submit it to your instructor as soon as possible, to allow the instructor to make arrangements. For more information, see the Student Handbook. <http://catalog.uh.edu/content.php?catoid=4&navoid=791>.

**Standard Disclaimer:** This syllabus is subject to change at the discretion of the instructor.

### List of Topics to be Covered

Chapter	Sections	Topic
1	Overview	History
<b>Geometric Optics</b>		
4	4.1-4.5	Fermat's Principle
5	5-1-5.2	Lenses
6	6.1-6.2.1	Matrix Method for Lens Systems
5	5.3-5.4	Mirrors
6	6.2.1	Matrix Method for Mirrors
5	5.5.1	Prism
5	5.6	Optical Fibers
6	6.3	Aberrations
<b>Wave Optics</b>		
2	All	Wave Motion
<b>EM Approach to Wave Optics</b>		
3	3.3-3.3.2	EM Theory
4	4.6	Fresnel Equations
8	8.1-8.8	Polarization
8	8.13	Matrix Approach to Polarization
9	9.1-9.6	Interference
10	10.1-10.3	Diffraction
7&11 or 13	TBD	Fourier Optics or Lasers