PHY300, Waves and Optics, Fall 2024 Syllabus

The physics of oscillations and waves, from mechanical waves to light waves to electron waves. Topics include resonance and normal modes of coupled oscillators, the wave equation and wave propagation, interference and diffraction, polarization, imaging and coherence. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: PHY 132/PHY 134 or PHY 142/ PHY 134 or PHY 126/PHY 127/PHY 134 Co-requisite: MAT 203 or MAT 205 or AMS 261 or MAT 307

4 credits

Professor: Laszlo Mihaly

Office: Physics Building B145 (on the bridge to the Math building), Email: mailto:Laszlo.mihaly@stonybrook.edu Office Hours Thursday 1:00-2:00pm
Teaching Assistants: TBD

Textbooks: Vibrations and Waves by Anthony French, Modern Optics by Grant R. Fowles

Lectures/Labs: MW 11:00am-12:20 pm, F 11:00am-12:50 pm

WEB site: http://solidstate.physics.sunysb.edu/teaching/2024_fall/phy300/

Grading: HW 10%, Midterm Exams 30%, Worksheets & Lab work 30%, Final Exam 30%

Course format: Lectures and laboratory experiments are integrated in Studio Physics format.

1. A worksheet will be posted on the course WEB site for each week. Worksheets must be initialed by the TAs each day. They are due on the Monday of each week in class.
2. Homework and Lab Reports are due on Friday in class. HW solutions will be posted on the course website on the date the HW is due. No late HW or Worksheets will be accepted.

Learning objectives

1. Students will demonstrate mastery of physics concepts related to oscillations, waves, and optics, Students will be able to think critically and apply appropriate physics concepts in analyzing qualitative problems.
2. Students will demonstrate the ability to apply mathematical reasoning, including calculus, in solving quantitative physics problems.
3. Students will demonstrate scientific communication skills through thoughtful discussion, collaborative problem solving, and understanding of experimental results.

Exams. There will be 2 midterms and one final exam. The midterms are during class time, see the attached course schedule. The exams are closed books, no external help. A very short formula sheet will be given with the exam.

Artificial Intelligence (AI)
The use of AI is allowed, except during the quizzes and exams. For example, looking at ChatGPT, in my experience it can correctly approach many of the homework and exam problems. It also gives a nice verbal explanation, outlining the basic steps to the solution. It acts a little bit like a private tutor. Most of the time the solutions is incomplete and sometimes ChatGPT makes mistakes. Discovering the error in ChatGPT's reasoning is also very educational.

Religious Holidays: If the schedule of home works, exams or other assignments is in conflict with your religion's Holidays, please let me know in an email by the end of the first week of instructions and I will do my best to accommodate your needs. Please note that I cannot make changes in the course schedule after the first week of classes. No consideration will be made if someone approaches me in this matter at a time close to the due date or the exam date.

Americans With Disability Act: If you have a physical, psychological, medical or learning disability that may impact your ability to carry out assigned course work, contact the staff in the Disabled Student Services office (DSS), 128 Educational Communications Center, 632-6748/9. DSS will review your concerns and determine with you what accommodations are necessary and DSS will advise me. All information and documentation of disability is confidential.

University Academic Integrity Statement: Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at:
http://www.stonybrook.edu/uaa/academicjudiciary/

Critical Incident Management: Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn.

Week of	Topic	Reading	Worksheet	Homework/Lab Reports
26-Aug	Simple Harmonic Oscillator	French Ch 1, 2	#1	-------
2-Sep	Damping, Driving, Energy	French Ch 3,4	#2	French 1-1,1-2,1-5,1-6, 2-1,2-2,2-3,2-4
9-Sep	Coupled Oscillators	French Ch 5	#3	French 3-1,3-2,3-3, 3-13,4-3,4-5,4-10, 4-13, (Bonus: 3-18)
16-Sep	Normal Modes	French Ch 5	#4	French 4-16, 5-2, 5-4, 5-9, 5-10
23-Sep	Strings & Travelling Waves	French Ch 6	#5	Lab report #1 Coupled Oscillators
30-Sep	Fourier Series	French Ch 6,7	#6	French 6-1,6-2,6-6, 6-11
7-Oct	Pulses	French Ch 7	#7	French 6-12,6-14,7-1, 7-2,7-3,7-4
14-Oct	(Mon: Fall Break) Plane Waves	Fowles Ch 1	#8	French 7-5,7-6,7-8, 7-9, (Bonus: 7-16)
21-Oct	Polarization	Fowles Ch 2	#9	Fowles 1.2,1.3,1.5,1.6
28-Oct	Reflection & Refraction	Fowles Ch2	#10	Fowles 2.8,2.10,2.12,2.16
4-Nov	Interferometers	Fowles Ch 3,4	#11	Lab report #2 Polarization
11-Nov	Diffraction	Fowles Ch 5	#12	Fowles 3.6, 4.1 (see eqns 4.9 and 4.20), 4.5
18-Nov	Ray Optics I	Fowles Ch 10	#13	Fowles 5.4,5.9,5.12 (Note Typo should be 2h/b+1). Bonus: 5.14
25-Nov	Thanksgiving			
2-Dec	Ray Optics II & Review	Fowles Ch 10		Fowles 10.5,10.6,10.7

14-Oct	Fall break
23-Sep	Midterm 1 covers worksheets #1 - #3
4-Nov	Midterm 2 covers worksheets #4 - #9
25-Nov	No classes at Thanksgiving week
18-Dec	11:15am - 1:45pm, Final exam, covers 50% worksheets #1- #9, 50% #10 - #13