

**PHO 101 Introduction to Light and Lasers**  
**Also listed as PHY 103 Photonics Concepts**  
**3 Credits (4 class hours/week)**

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Office hours TBA

**Course Description:**

In this course, will explore the nature of light, learn where light comes from and the units used to measure light, the laws of reflection and refraction and how these lead to image formation, the nature of waves, and the wavelike behavior of light. We will also investigate applications of light in nature and technology for every concept we study.

All concepts will be reinforced through regular homework assignments, demonstrations and computer simulations (including applets found on the internet.) All students need to have internet access (we also do a lot of communicating by email); the lab will be open during the week so that students who do not own a computer can complete assignments.

***This is an “inquiry-based” course – there are hands-on activities nearly every day. Activities are completed in teams, which means that if you are absent you will miss a difficult-to-replicate educational experience- and you will let your team down.***

***I expect that, as with any job, you will notify me by email ([jdonnelly@lasertechnonline.org](mailto:jdonnelly@lasertechnonline.org)) or phone (860-885-2353) if you will not be in class (for a valid reason). You are responsible for arranging to make up what you missed.***

**Text:**

• **LIGHT: Introduction to Photonics** The bookstore will not carry this book, since it is from a printer, not a publisher. It is available at <http://www.lulu.com/shop/search.ep?contributorId=630411> as a pdf download, paperback or hardcover. There are also reference copies in the lab.

• There are some books that might be handy for reference (they may be found college library or the lab library in B207). These texts may be at a high math level.

- Pedrotti and Pedrotti, Introduction to Optics, Prentice Hall (requires advanced calculus)
- Wilson and Buffa, College Physics (or other high school or college physics text)
- Photonics Spectra and Laser Focus World (these are monthly trade journals you can subscribe to for free)
- Hecht, Optics, Addison Wesley (this also has calculus, but the drawings and photos are wonderful)
- Videos The PHOTON Projects web site (<http://www.photonprojects.org>) has videos of your truly and friends doing some of the labs you will be doing in this

course. Look under the “teaching resources” tab.

There are many online resources as well- check out <http://www.lasertechnonline.org> for a list.

**Prerequisites/Corequisites:**

MAT 095 is a corequisite (or instructor's permission). This course is acceptable for students who have not passed ENG 100 or did not place into ENG101 on the placement test. If you never had a course in chemistry or physics (or need a refresher) you should check out the tutorials on my web site, <http://www.lasertechnonline.org>.

**Communications**

***I communicate mostly by email. I am not often near a phone, and I'm not going to be texting all of you or posting on your Facebook wall. So please check your email often.***

And while you're at it- be sure you have a professional email for school and work use.

**PHO 101 Introduction to Photonics  
Topic List**

Light sources

- Electromagnetic spectrum
- Production of light (atomic theory)
- Characteristics of different types of light sources/radiometry and photometry

Geometric optics

- Shadows and pinhole cameras
- Law of reflection (plane mirrors, spherical mirrors)
- Index of refraction (and other glass properties)
- Law of refraction (index of refraction, total internal reflection, optical fiber)
- Prisms (uses of prisms)
- Lenses (converging, diverging, Lensmaker's equation, thin lens equation for problems with one lens)
- Optical Instruments using lenses (the eye, corrective lenses as time permits)

Wave Optics

- Vibrations and Waves
- Superposition/2-slit experiment
- Holography and interferometry
- Diffraction
- Polarization

**Hands-on Experiments:** You will do a lab experiment in nearly every class. Ideally, *you will learn by doing and critically thinking about what you observe.* You will also participate in some group problem solving activities to strengthen you ability to work in a real-life technician situation.

**WHAT YOU'LL BE GRADED ON**

**Lab Reports**

Some labs will be informal and you will turn in a data sheet and calculations, and questions on your methods and results. Other labs will require a more complete analysis. You will be instructed on their details before each experiment begins. Some labs will just be checked (+ or -) and other labs will be graded out of 10 points. Lab due dates depend on the complexity of the lab. I hate grading late labs so if your lab is late you will lose points.

### **Tests**

Tests will focus material you will need to know for succeeding optics courses. Open-ended questions based on industry applications will also be included. Usually in-class tests are on conceptual material (no calculations). Some tests may be take-home, with group work encouraged; these will be more complex problems for you to solve.

### **Class Participation**

The class participation grade will depend first and foremost on attendance. I take attendance and mark late arrivals so being on time is important too. I may collect homework once in a while and use it toward the class participation grade. Occasional assignments, such as research on companies we will visit, will be graded and included in this category. Volunteering in outreach activities counts too!

### **Final grade**

Tests and quizzes	40%
Class Participation	10% (-1 for each unexcused absence, +1 for each volunteer activity or field trip)
Hands-on activities (labs)	50% (drop lowest grade)

### **Cell phone policy**

***Cell phones and pagers must be turned off during class or lab activity time. Yes, this means you. Multitasking does not work. Really.***

### **Students with Disabilities**

*If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact the Disabilities Counseling Services at 383-5240. To avoid any delay in the receipt of accommodations, you should contact the counselor as soon as possible. Please note that I cannot provide accommodations based upon disability until I have received an accommodation letter from the Disabilities Counselor.*