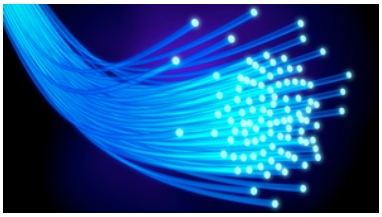
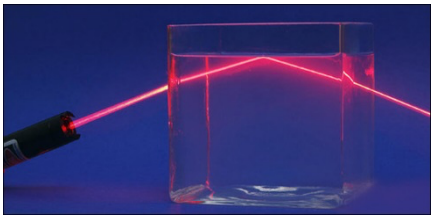


Physical Optics
PHYS 365



Instructor: Dr. Charles Lusignan, cplsps@rit.edu

my pronouns: he, him, his

Office: 2325 Hugh Carey Hall (HLC-2325)

Office Hours:

(tentative) Tu & Th 10:00 am - 10:50 am in GOS-3154

F 12:00 pm - 12:50 pm in my office

Zoom or in-person at other times by appointment

Feel free to e-mail me with any questions & concerns

This course meets in-person 3 days each week: 2 lectures and 1 lab

Lecture:	M, W	10:00 - 10:50 am	in LBR-A230 (Liberal Arts Hall)
Lab:	Tu	2:00 - 4:50 pm	in POptics Lab: 3261 Gosnell Hall

Tell me and I forget. Teach me and I remember. Involve me and I learn.

— Xunzi

Course Overview:

This is a one-semester introduction to optics at an intermediate level, with a focus on doing laboratory experiments and modelling the data using python. It is an intense course in calculus-based physics focusing on electricity and magnetism and optics. Topics covered include: light as waves, rays, and photons, laser beams, reflection and refraction, lenses, diffraction and interference, and polarization.

What will you get out of this course? Mainly, hands-on lab experience and well-developed skills in critical thinking and data analysis. You'll learn lots of optics and physics along the way too.

Due to the coronavirus, we will all need to be flexible and adaptable throughout the term. Each day remember to be patient and kind. There will be challenges, but by working together, we will all get through it successfully.

If it is necessary for the class to go to remote instruction during the semester, we will continue to meet online each class day using Zoom. Exams and HW will be unaffected, as they are already online. Labs will be adjusted as needed. I will post a zoom link as an announcement on myCourses.

If this syllabus needs to be modified during the term, I will alert you in class and with a myCourses announcement. I will also post the updated syllabus on myCourses with a new version number.

Always try to be a little kinder than is necessary.

— J.M. Barrie

Required Course Materials (to obtain immediately)

We will start using these on Wed of week 1, in class 1B

- **i>clicker Student** (~ $16)

  Download the smart-phone app and purchase access in-app from Macmillan: https://www.iclicker.com/students

  When you start the app the first time, you must add our class. Search for my last name "Lusignan" (For Institution, make sure to choose "Rochester Institute of Technology and NTID" and not the RIT Engineering server; If you can't find the class, check the Institution) then select:
  Lusignan POptics PHYS-365

  Note: You can also access i>clicker using a laptop from https://www.iclicker.com/students *i>clicker has a 14-day free trial. Remember to purchase them on day 12!* ☺

- **BYU open source textbook** (free)

  "Physics of Light and Optics", by Justin Peatross and Michael Ware (2015 rev Nov 2023).
  - Posted as a pdf on myCourses for you to download
  - Available for web access as well: http://optics.byu.edu/textbook.aspx
- Scanning software for your smart phone (I suggest the free ScanPro or Adobe Scan)
- **Python and Jupyter** (free)
  - RIT laptop computers with python installed will be provided for your use in laboratory, however, you may choose to use your own laptop instead
  - You can install the Anaconda python distribution (current version) on your own Windows or Mac laptop: https://www.anaconda.com/products/individual
- **Waveforms (analog discovery2 oscilloscope control software) (free)**
  - RIT laptop computers with Waveforms installed will be provided for your use in laboratory, however, you may choose to use your own laptop instead
  - You can install waveforms on your own Windows or Mac laptop: https://digilent.com/shop/software/digilent-waveforms/download

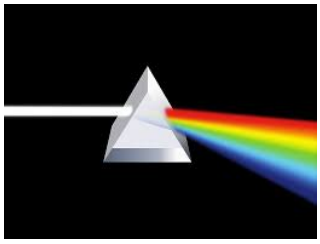
Here we are, the most-clever species ever to have lived.
So how is it that we can so easily destroy the only planet that we have?

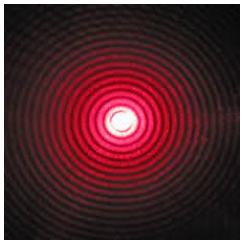
— Jane Goodall

Course Structure:

Group work in both class and lab is central to this course because that is how real work physicists operate in both industry and academia. This class will stress equally hands-on experiments and a computational modeling of data (using python). Our models will represent complex optical systems, and make the computer do the all the "hard" work. We will do analytical calculations and fit those models to data as well. In the optics lab, we are going learn about experimental design, build and align standard table-top optical setups (lenses, lasers, etc.), and keep a high-quality scientific notebook.

Lecture Class (Mondays & Wednesdays)





We are going to study light in 5 major units

1. Geometric optics (rays, lenses, imaging)
2. Creating and detecting light
3. Laser Beam propagation
4. Interference and diffraction
5. Polarization and light-matter interactions

To promote Active Learning during class, I will assign pre-class textbook readings or provide video lectures. I strongly encourage you to take notes on these pre-class assignments and discuss them with other students.

We will use i>clickers during the M & W lecture classes. The goal is to get you to discuss the material with each other. Studies show this how deep-learning takes place.

Laboratory class (Thursdays)

This is the real heart of the class where theory meets experiment and analysis. We will work in groups of two or three students. Each group will be provided with a Lab Guide for each week's experiment that will outline the lab and analysis required. They will build and perform the experiment using the provided equipment and analyze the data in python. All members will receive the same grade.

We will use Onenote for our lab notebooks to document our experiments and spreadsheets and python to analyze data. The setup should be similar to what you have done in Modern Lab and Advanced Lab classes.

Give a person a fish, and he will eat for a day.
Teach a person to fish and they will eat for life.
— ancient Indian and Chinese proverb

Course Grade breakdown

Lecture (50%)

20%	In-class participation (clickers and general attendance)
30%	Homework

Lab (50%)

30%	Lab notebook (documenting lab work and python analysis)
10%	Final project paper (one experiment written up as for submittal to a journal)
10%	Lab participation (collaboration, on-task, attendance)

Pre-lecture readings, post-lecture video assignments, and myCourses quizzes: See the assignment schedule posted on myCourses for assigned readings and videos. These will not be graded, but you still should do them.

In-class participation: Will mostly be for in-class clicker participation

Homework: Homework will be assigned for each unit. These will be a combination of paper/pencil problems and computational problems that are to be solved using Python.

Final Project Paper: In place of a traditional final exam, we will write-up one of our experiments as if it were going to be submitted to a peer-reviewed technical journal. I'll let you pick one from a list of them. We will likely use our scheduled final exam time for some lab-related activity, but there will be no written or oral exam.

Lab notebook: Each week your lab group will document their laboratory work in a digital lab notebook. To keep things as simple as possible we will be using Onenote to organize things. These notebooks will contain your data, images, equations, calculations, graphs, and written discussions of your results and the experiment's goals. You should also include your ideas and suggestions for further work. Make sure to include all group members names at the top. You will be given a rubric for notebook grading. Labs are due the week after we finish them in class.

Lab participation: These points are awarded for consistently working hard, showing up on time, being a good lab partner, and generally being engaged throughout the lab. If you show up late consistently, are talking and doing things off-task, or don't contribute to your group, this is where you will lose points. If you are focused, engaged, and respectful, you will earn these points.

Exams: There are no traditional mid-term or final exams

Due dates will be specified in myCourses for each assignment (including lab notebook submittals)

The academic demands in this course and your other classes can be understandably difficult. It is normal to feel anxious about your academic ability, especially when unexpected life events emerge. I invite you to connect with me about any difficulties you have in this course as soon as possible. Your success is important. If you need it, I want you to get any additional assistance needed before the challenges become overwhelming.

The value of a college education is not the learning of many facts,
but the training of the mind to think.

— Albert Einstein

Clicker score:

In almost every lecture class, we will do clicker polling questions together using your electronic device (laptop or smart phone). Correctness of answers is important, and you will often work in peer groups. Typically, the first few clicker questions will be an individual quiz on material covered in previous classes or homework. This is to help you identify any gaps in your understanding.

All polling responses are automatically graded by the i>clicker server and each question is weighted equally; this will result in a clicker point score for that day. If you answer all questions that day, I'll add 3 bonus participation points to your day's clicker score. You also get 1 point for trying to answer each question and another 2 for getting the correct answer. All of the points will be tallied at the end of the semester and divided by the total points possible to get your overall clicker score.

Clicker questions can-not be made up. To account for missed class days, I will multiply the clicker score by 1.10 at the end of the term; this will be your clicker score. You all have the equivalent of 3 days of missing clickers without penalty. Save your 3 free-pass days for RIT sanctioned events and unexpected illnesses.

Homework score:

Each question on the assignments will be worth a specific number of points. Your points will be tallied at the end of the semester and divided by the total points possible to get your overall homework score.

Lab score:

Each lab will be worth 25 points. Your notebook will be graded and the rubric is posted on myCourses. Your points will be tallied at the end of the semester and divided by the total points possible to get your overall lab score. Labs are due the week after we finish them in class.

Course Letter Grades:

Your final grade will be calculated as detailed above in the Grading section. This number will be converted to a letter grade and posted in SIS using the +/- grading system. The following chart shows the final course percentage that will guarantee at least the letter grade shown. Finer-grained divisions in the A, B, and C ranges will only be determined after a careful analysis at the end of the semester, including a comparison of our sections to other UP 2 sections. If the grade boundary cutoffs change, they will only be lowered, not raised.

A-: ≥ 90.0, B-: ≥ 80.0, C-: ≥ 70.0, D: ≥ 60.0, F: < 60.0

Knowing a great deal is not the same as being smart; intelligence is not information alone, but also judgement, the manner in which information is coordinated & used.
— Carl Sagan

Policies for this course

Course Modality

This is an in-person course for both lecture and lab classes. Class will not be recorded.

If for some reason you cannot participate in lecture of lab class (e.g. you are ill), please contact me as soon as possible and we will discuss the path forward. We have some flexibility to do lab make-ups in unusual circumstances. If an assignment deadline needs to be changed, then please be prepared to submit documentation to support your request.

Class and Lab Attendance:

If you don't attend class or lab, history suggests that you will not do well in the course. You are responsible for making up all class activities you missed, even if they are not explicitly graded.

RIT policy is that it is the student's responsibility to notify the faculty member in advance of any planned absence due to personal obligations such as religious holidays, job interviews, athletic contests, etc.. With advance notice of the planned absence, it is the instructor's responsibility to ensure that the student can fulfill all class assignments and expectations without penalty or bias.

It is better to make a good future, than to predict a bad one.

— Isaac Asimov

Academic Honesty:

When you work on assignments cooperatively, but turn them in individually, all written work must be expressed in your own words. If there is reasonable evidence of copying, it will be construed as an act of plagiarism and each student involved will receive a failing grade on that assignment. Any act of academic dishonesty on quizzes or exams will receive failing grades and is reported to the school head.

Disruptive behavior:

Please be considerate of your classmates. If your behavior is detrimental to the class, or unsafe, you may be asked to leave. We are all adults, so let's avoid this situation, please.

Power-Point Slides/Handwritten Notes:

I will post these as pdfs on myCourses after each class. Answers to the clicker questions are in posted the power point slides files with names in the format "365 class XY title – Lusignan date"

It is invaluable to have a friend who shares your interests and helps you stay motivated.

— Maryam Mirzakhani

Email Communication:

I check my e-mail often. Please don't hesitate to reach out to me for any reason.
I will post announcements on our myCourses website, so please check it often.
Check your RIT email account on a regular basis for communications from me.

Remote/Zoom Classes:

In the case of instructor illness, class may need to be held remotely. In such a case, you will be contacted via myCourses and/or e-mail. If possible, class will be held via Zoom. I will provide the class with details, as appropriate.

Canceled Classes:

In the case of university closure or instructor illness, you will be contacted via myCourses and/or e-mail. I will provide the class with details, as appropriate.

In such a case, this syllabus and lab or assignment due dates are subject to change.

Technology Issues:

If something unexpected happens (e.g. power failure, internet crash) that prevents completion of homework or a lab, email me as soon as possible. Not procrastinating will make sure that these inconveniences do not turn into emergencies.

Late assignments:

Lab notebooks and HW assignments submitted after the due date may be docked by 10% per/day.

Academic adjustments and accommodations:

RIT is committed to providing academic adjustments to students with disabilities. If you would like to request adjustments such as special seating or testing modifications due to a disability, please contact the Disability Services Office. It is located in the Student Alumni Union, Room 1150; the website is www.rit.edu/dso. After you receive adjustment approval, it is imperative that you see me during office hours so that we can work out whatever arrangement is necessary.

RIT's SAFE LEARNING environment

RIT is committed to providing an environment free of harassment and discrimination as articulated at: www.rit.edu/academicaffairs/policiesmanual/policies/governance

RIT's policies require faculty to share information about incidents of gender-based discrimination and harassment with RIT's Title IX office regardless whether the incidents are stated to them in person or shared by students as part of their coursework.

If you have a concern related to gender-based discrimination and/or harassment and prefer to have a confidential discussion, assistance is available from one of RIT's confidential resources on campus:

1. The Center for Women & Gender: Campus Center Room 1760; 585-475-7464; CARES (available 24 hours/7 days a week) Call or text 585-295-3533.
2. RIT Student Health Center – August Health Center/1st floor; 585-475-2255.
3. RIT Counseling Center - August Health Center /2nd floor - 2100; 585-475-2261.
4. The Ombuds Office – Student Auxiliary Union/Room 1114; 585-475-7200 or 475-2876.
5. The Center for Religious Life – Schmitt Interfaith Center/Rm1400; 585-475-2137.
6. NTID Counseling & Academic Advising Services – 2nd Floor Lynden B. Johnson; 585-475-6468 (v), 585-286-4070 (vp).

- *The way of progress is neither swift nor easy…*
- — Marie Curie