PHYS 1230: Light and Color for Non-Scientists

Spring 2021

Instructor: Tyler McMaken ("mik-MACK-en") **Email:** tyler.mcmaken@colorado.edu
Office Hours: Mon 2–3pm, Fri 11am–12pm
TA/Grader: Ethan Andersen **Email:** ethan.andersen@colorado.edu
Office Hours: Mon 5–6pm, Wed 5–6pm

Class Time: TuTh 12:45pm–2:00pm MT **Location:** Duane G1B30 (and Zoom)
Course Webpage: https://canvas.colorado.edu/courses/69432

First and foremost, I want to acknowledge that this semester is an abnormal one, and most if not all of you are under quite a bit of stress from various external pressures. My hope is that this course would not add to your worries—I will be as flexible as I possibly can, the material should be approachable for all regardless of your math/science background, and much of the course work is designed to be completed during the class time. If you ever have any worries about the course or any personal stressors, just let me know. I'm here to support you in your learning and to make sure you have an enjoyable and healthy experience.

Course Overview:

Physics 1230, Light and Color for Non-Scientists, is a 3-credit course designed for non-physics students to explore the inner workings of our visual perception of the Universe in a way that is both informative and enjoyable. The goals of the course are as follows:

1. Gain a physical intuition for how light behaves, including how it can be *generated* (incandescence, fluorescence, etc.), *transmitted* (ray-tracing, waves, etc.), and *perceived* (cameras, eyes, color theory, etc.)
2. Engage in the process of the scientific method by examining scientific theories and grounding them in direct physical observations that can be verified by any observer with adequate skills and equipment
3. Discover the joy in using science to understand how the world works (a.k.a. have fun learning!)

The course is taught by Tyler McMaken (he/him/his), a graduate part-time instructor (GPTI) in the Department of Physics who has earned multiple teaching awards during his time at CU. The course meets for two 75-minute periods each week, which most days will consist of a 50-minute lecture (on Zoom and optionally in-person) followed by a short Canvas participation assignment to be completed in groups during the last 25 minutes of class. Lecture slides and Zoom recordings will be posted within a few hours after each lecture, and each participation assignment will be due by the start of the next lecture. The course will also include written homework assignments due every other week, a midterm exam, and a final project.

Office Hours:

Though we cannot meet for office hours in person, one-on-one interactions with the instructor are still possible and are highly encouraged for all your classes. For this course, I will hold office hours on Zoom every **Monday from 2–3pm MT** and **Friday from 11am–12pm MT** to answer any questions or simply to chat. You should also feel free to email me questions or set up a time to video chat (I can be very flexible with my schedule—just ask!).

Additional office hours will also be hosted by the TA, Ethan Andersen, on **Mondays and Wednesdays from 5–6pm MT**. If you'd like additional help or have trouble making any of these times, the Physics Department has created a remote help room for faculty and TAs to help any students with any physics course throughout the week. Just click one of the links any weekday 9am–9pm to join a Zoom room and ask for some help.

Textbook & Course Materials:

The recommended text for this course is *Seeing the Light: Optics in Nature, Photography, Color, Vision, and Holography* by David Falk, Dieter Brill, & David Stork (3rd edition, Echo Point Books). Earlier editions are also just as good and probably cheaper. I don't want to force anyone to buy an expensive textbook for this course, so **we will not use the textbook for homework problems or required readings**, but it is a good companion resource if you want to see materials from the lectures presented in a comprehensive way. Readings corresponding to each lecture are posted on the course schedule.

Other necessary materials for this course include a calculator capable of arithmetic and simple trigonometry (most phones nowadays can do this, or if nothing else, Google can), access to the iClicker Reef software, and some household objects like tape and flashlights for the some of the homework activities.

Grading:

- 10% of your grade is determined by your participation in multiple-choice **iClicker questions** given during each lecture. These concept-check polls will not be graded for accuracy; wrong answers also count for full credit. Every student must register for the class through iClicker Reef. The course name to search for is "PHYS 1230: Light and Color (Spring 2021)." If you aren't able to attend lectures synchronously, equivalent iClicker Assignments will be available following each lecture and will remain open until the next lecture. Your lowest 2 weeks of poll grades will be excluded from your final grade calculation.
- After each lecture you will also be required to complete a short Canvas quiz **participation assignment**. These assignments are designed to be completed in Zoom Breakout Rooms with your peers during the second half of class time, but those viewing lectures asynchronously may complete them individually—they are due by the start of the next lecture. You will get 3 attempts for each quiz, and your lowest 2 assignments grades will be dropped.
- An additional 25% will come from five **written homework activities** due at the start of class on Tuesdays (1/26, 2/9, 2/23, 3/23, and 4/13). These assignments may require a hands-on component and must be submitted to Canvas as a PDF (scanned from a hand-written page or converted from a word doc).
- The remaining 40% will come from an untimed **midterm exam** and a **final project**, in which you will choose something that interests you in the course to explore further, either doing a homemade experiment or writing a research paper. More information about these will be posted on Canvas.

Assignment	Percentage of final grade	Date
iClicker questions	10%	every lecture
Participation assignments	25%	every lecture
Written homeworks	25%	$\sim$ every other week
Midterm exam	20%	Tues. Mar. 9
Final project	20%	due finals week

Final letter grades will be assigned using the standard CU grading scheme, though this scheme may be slightly shifted at the instructor's discretion (but such a shift would only make final letter grades more favorable to students, never less favorable).

Late policy:

All participation assignments and written homeworks may be submitted at any point after their due dates until the last day of class. In the case of a late submission, 10% will be deducted for each day that the assignment is late, until 5 days have passed. After 5 days, the maximum score you may receive will remain at 50%. Exceptions may be granted if extenuating circumstances are brought to the instructor ***before the assignment is due*** (full credit is rarely given for after-the-fact excuses).

Prerequisites:

Though no prior college courses are required for enrollment in this course, all students must have two units of high school algebra and one of geometry (in other words, you may not have a math MAPS deficiency). High school math will be used regularly, but the course will not use or develop any higher mathematics.

Instruction mode:

Because PHYS 1230 is a science demo-heavy course, lectures will be given in-person in Duane G1B30 (342 seats) when allowed by the University—the current start date for in-person instruction is Feb. 15. However, regardless of whether in-person instruction is allowed, lectures will **always** be streamed live on the video conferencing platform Zoom (information about setting up Zoom can be found here). All students attending virtually are encouraged to engage actively and synchronously during lectures; however, if extenuating circumstances prevent you from attending synchronously, lectures will be recorded and posted on Canvas for asynchronous viewing, and all time-sensitive assignments and exams may be completed at any point within at least a 24-hour time frame. These recordings will only be made available to individuals registered for the course, for the duration of the semester.

Zoom security:

Zoom-bombing is an unfortunate side-effect of virtual learning, but we will make every effort to make sure we can learn together in a safe, distraction-free, yet accessible environment. To ensure this, make sure you are logged into Zoom with your CU email account and that your Zoom name matches your own. In addition, the link and password for the Zoom meetings will only be shared with registered students, and under no circumstances may you share this information with anyone not registered for the course.

Zoom etiquette:

Learning in a virtual classroom is much different from participating in person. It is much easier to get distracted or not engage fully, so below are some guidelines to help you get the most out of your experience. On the first day of class, we will collectively come up with a list of group norms based on our own values and needs, but until that time, here's a list to get you thinking:

- **Use your video** if you are able—this will not only help you to stay engaged and connect better with your peers (two crucial aspects of learning), but it will also help me as a teacher (it's much harder to teach to a bunch of black screens!).
- Try to **engage** in each class as much as you would in person—try to ask at least one question each lecture, participate in all iClicker polls, and make the most of your Breakout Room time. Don't try to multitask, use your phone, etc.; give your full attention to the class.
- **Be punctual**. It is much easier to lose track of time both for the instructor and students in a virtual environment, so make an extra effort to show up to class on time, and I'll commit to making sure lectures don't go over time.
- **Don't spam the chat box**—it is a helpful tool to ask questions and to clarify content, but it can also be distracting for students if side conversations are constantly happening throughout a lecture.
- **Mute your audio** to limit background noise distractions, unless you have a question or comment.

Classroom Behavior:

Both students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote or online. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. For more information, see the policies on classroom behavior and the Student Code of Conduct.

Requirements for COVID-19:

As a matter of public health and safety due to the pandemic, all members of the CU Boulder community and all visitors to campus must follow university, department and building requirements, and public health orders in place to reduce the risk of spreading infectious disease. Required safety measures at CU Boulder relevant to the classroom setting include:

- maintain 6-foot distancing when possible,
- wear a face covering in public indoor spaces and outdoors while on campus consistent with state and county health orders,
- clean local work area,
- practice hand hygiene,
- follow public health orders, and
- if sick and you live off campus, do not come onto campus (unless instructed by a CU Healthcare professional), or if you live on-campus, please alert CU Boulder Medical Services.

Students who fail to adhere to these requirements will be asked to leave class, and students who do not leave class when asked or who refuse to comply with these requirements will be referred to Student Conduct and Conflict Resolution. For more information, see the policies on COVID-19 Health and Safety and classroom behavior and the Student Code of Conduct. If you require accommodation because a disability prevents you from fulfilling these safety measures, please see the "Accommodation for Disabilities" statement on this syllabus. All students who are new to campus must complete the COVID-19 Student Health and Expectations Course. Before coming to campus each day, all students are required to complete the Buff Pass.

Students who have tested positive for COVID-19, have symptoms of COVID-19, or have had close contact with someone who has tested positive for or had symptoms of COVID-19 must stay home. In this class, if you are sick or quarantined and cannot attend lectures virtually, email the instructor before any due dates have passed to request an extension.

Accommodation for Disabilities:

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to the instructor in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the Disability Services website. Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance. If you have a temporary medical condition or injury, see Temporary Medical Conditions on the Disability Services website.

Preferred Student Names and Pronouns:

CU Boulder recognizes that students' legal information doesn't always align with how they identify. Students may update their preferred names and pronouns via the student portal; those preferred names and pronouns are listed

on instructors' class rosters. In the absence of such updates, the name that appears on the class roster is the student's legal name.

Honor Code:

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code. Violations of the policy may include: plagiarism (including self-plagiarism), cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code (honor@colorado.edu); 303-492-5550). Students who are found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code as well as academic sanctions from the faculty member. Additional information regarding the Honor Code academic integrity policy can be found at the Honor Code Office website.

Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation:

The University of Colorado Boulder (CU Boulder) is committed to fostering an inclusive and welcoming learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct (harassment, exploitation, and assault), intimate partner violence (dating or domestic violence), stalking, or protected-class discrimination or harassment by members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or cureport@colorado.edu. Information about the OIEC, university policies, anonymous reporting, and the campus resources can be found on the OIEC website.

Please know that faculty and graduate instructors have a responsibility to inform OIEC when made aware of incidents of sexual misconduct, dating and domestic violence, stalking, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about options for reporting and support resources.

Religious Holidays:

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. If you anticipate a conflict, please contact the instructor within the first two weeks of class so that reasonable accommodations can be arranged. See the campus policy regarding religious observances for full details.