

# PHYS 1400 *Fundamentals of Scientific Inquiry*

Fall 2021

## 1 Sections, Instructors, & Office Hours

Section	Days/Time	Room	Instructors	E-mails
801	TTh 5:30-6:45 p.m.	DUAN F1117	Tyler McMaken Hassan Hassan	tyler.mcmaken@colorado.edu hassan.hassan@colorado.edu
802	TTh 5:30-6:45 p.m.	DUAN G1B31	Hope Whitelock Federico Ameijenda	hope.whitelock@colorado.edu federico.ameijenda@colorado.edu

Office hours are as follows:

Hope: TTh 5:00-5:30 pm, DUAN G1B31

Federico: TTh 6:45-7:15 pm, DUAN G1B31

Tyler: TTh 6:45-7:15 pm, DUAN F1117

Hassan: TTh 5:00-5:30 pm, DUAN F1117

Instructors will hold office hours in their respective classrooms. You may also contact your instructors via e-mail (use the addresses listed above) to set up meeting times outside of the times listed. For general questions for any of the instructors, you can always contact the class email, [phys1400@colorado.edu](mailto:phys1400@colorado.edu)

## 2 Course goals

The goal of the course is to introduce students to what it means to be a scientist by developing creative problem solving skills, improving communication and collaboration, and introducing students to cutting-edge research (without the confusing jargon).

Over the course of the semester we will:

- **Practice developing scientific models that give insight into the way things work.** In building models, we will try to condense complicated situations into the simplest useful picture. We will do this by identifying questions, determining the important variables and parameters, collecting and analyzing data, and drawing conclusions based on that data.
- **Better understand how we think and learn.** Science is about finding out new things, so it helps to first find out how we learn. We will see that academic ability is like a muscle we can strengthen it by using it. By implementing strategies developed through years of education research, we can improve ourselves both as students and scientists.
- **Reflect and refine.** From Galileo to Newton to Curie to Einstein and beyond, scientists are repeatedly refining their (and our) understanding of reality. The models that we learn in our science classes are not the end of the story. You will find that as you progress in your coursework, you will revisit the same models again and again, digging deeper into the complexity of the model each time. Our work as scientists is to find the places where models can be extended, tweaked, or even completely overhauled. Similarly, throughout our lives we adjust our ideas about who we are, what we value, and how we learn. We benefit from self-reflection both as scientists and students.
- **Collaborate effectively in groups.** Modern science is so complex that scientists rarely work alone. The ability to work and communicate with others is therefore crucial.

### 3 Course format

This course consists of two 75-minute sessions each week. Most work in class will be conducted in small groups, and information will be shared between groups through whole-class discussions. In the first half of the semester, we will practice the process of developing a scientific model and explore how we learn. The second half of the semester will consist of group projects in the form of longer experiments run by students. Interspersed throughout the entirety of the semester, there will be the CU-Prime talks from undergraduates, graduate students, or postdocs. These talks are designed for undergraduate students, and the goal is to give students a glimpse into physics research being done at CU.

#### 3.1 Expectations

This course is a letter-grade course, based on

- attending all class sessions, including CU-Prime talks,
- actively participating in class and being an engaging member of your team,
- completing small reflection assignments,
- completing the final group project.

Please inform your instructors in a timely manner if circumstances prevent you from meeting these expectations. Alternative activities can be assigned on a case-by-case basis. You will be required to be punctual and organized in this course. Please arrive on time for class, organize and keep track of any handouts and assignments, and do not pack up and leave before class time is over. In general, weekly assignments will be posted on Tuesdays and will be submitted on Canvas by the beginning of the next class of the same week.

#### 3.2 CU-Prime Talks

The CU-Prime Talks will take place in the Commons Room (DUAN F1117, Gamow Tower) every other Tuesday. During these talks, CU graduate students talk about their research, career path, and day-to-day work. This will give you an insight in the day-to-day life of a researcher. You will never be required to retain the specific science content of each talk, though when applicable, CU-Prime speakers will also tie in their work to what you are learning in PHYS 1400.

#### 3.3 Group Projects

The group projects in the second half of the semester are actual scientific studies of physical phenomena. Starting from scratch, with the help of a graduate or upper-division undergraduate advisor, each group (3-4 students) will write a short proposal on their experiment. Then, using the proposal, each group will devise and conduct an experiment in the subsequent weeks. At the end of the semester, each group will present their findings in a public poster session.

### 4 Course Calendar

Week	Date	Tuesday	Date	Thursday
1	8/24	Introduction	8/26	Models: Gravity
2	8/31	Models: Light Rays	9/02	Models: Light Bending
3	9/07	First CU-Prime Talk	9/09	Diversity Workshop
4	9/14	Models: Moon Formation	9/16	Group Match-up
5	9/21	CU-Prime Talk	9/23	Begin Group Projects
6	9/28	Failure in Science	9/30	Group Projects
7	10/05	Metacognition	10/07	Group Projects
8	10/12	CU-Prime Talk	10/14	Group Projects
9	10/19	Process of Science	10/21	Group Projects
10	10/26	CU-Prime Talk	10/28	Group Projects
11	11/02	Research Q&A	11/04	Group Projects
12	11/09	CU-Prime Talk	11/11	Group Projects
13	11/16	Lab Tours	11/18	Group Projects
-	11/23	Fall Break - no class	11/25	Fall Break - no class
14	11/30	CU-Prime Talk	12/02	Practice Presentation
15	12/07	Poster Session	12/09	Semester Wrap-up

## 5 Grading Breakdown

Though we do not intend for grades to be the main focus of this course, we use the following grade breakdown to assign individual grades as per University standards. All grades will be updated and posted on the course's Canvas site as the semester progresses. Final letter grades will be assigned using a standard grading scheme. For more information on individual items, see Expectations (3.1) above.

Item	Percentage of grade
Attendance	10%
Participation	40%
Reflection assignments	20%
Final group project	30%

## 6 Course Credit

PHYS 1400 is a one credit course. Although it is a valuable experience which will help you develop as a scientist, it cannot count for credit toward Physics major requirements in the college of Arts & Sciences, due to uncontrollable department standards. However, the course may count towards your graduation requirements as an elective credit, depending on your major. For more information on how credit for this course fits within your department's standards, please check with your academic adviser.

## 7 Online Resources & Emails

The Canvas site (link below) will be used to keep track of grades, for turning in reflection assignments due on Thursdays, and to access relevant information, including the syllabus, instructor information, and group project details. Any questions you may have throughout the course can be brought to the instructor team through the instructor team email address listed below. In addition, information about CU-Prime as a whole can be obtained on their website or through email.

Canvas site: [canvas.colorado.edu/courses/76610](https://canvas.colorado.edu/courses/76610)  
Instructor team email: [phys1400@colorado.edu](mailto:phys1400@colorado.edu)  
CU-Prime Website: [cuprime.org](https://cuprime.org)  
CU-Prime E-mail: [cu-prime@colorado.edu](mailto:cu-prime@colorado.edu)

## 8 Photo use consent

Throughout the semester, photos of various class activities will be taken. Some photos may have individual students as the focus, others may be photos of large groups/audiences in which your face is visible. We ask for your consent to use these photos in flyers, presentations, on our website, and through social media for promotional purposes. Your name and personal information would not be published in any way without your permission and knowledge.

If you do not agree to let us use photos we take of you, please let us know as soon as possible. Furthermore, you can always revoke the right to use your photos in the future, but not retroactively.

## 9 Late policy:

If, due to unavoidable circumstances, you are unable to complete an assignment by the set due date, please reach out to the instruction team to request an extension. With the exception of the final group project poster, we are always willing to accept late assignments. Full credit can still be received for assignments turned in late if extenuating circumstances are brought to instruction team **before an assignment's due date**, but if the instruction team does not hear from a student by the time an assignment is due, we reserve the right to apply a 25% grade reduction to any late assignment.

## 10 Special circumstances

### 10.1 Incompletes:

Rules of the University require that grades of incomplete (I) may be assigned only if "*for reasons beyond the student's control, the student is unable to complete the course requirements.*" "I" requests must be made in person to the instruction team.

## **10.2 Accommodation for Disabilities:**

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to the instruction team 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](mailto:dsinfo@colorado.edu) for further assistance. If you have a temporary medical condition or injury, see [Temporary Medical Conditions](#) under the Students tab on the Disability Services website.

## **10.3 Classroom Behavior:**

Students and faculty each have responsibility for maintaining an appropriate learning environment. 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](#).

## **10.4 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.

## **10.5 Honor Code:**

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code academic integrity policy. Violations of the Honor Code may include, but are not limited to: 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](mailto:honor@colorado.edu)); 303-492-5550). Students 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 on the [Honor Code website](#).

## **10.6 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 or against 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 email [cureport@colorado.edu](mailto:cureport@colorado.edu). Information about OIEC, university policies, [reporting options](#), 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 their rights, support resources, and reporting options.

## **10.7 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. In this class, please approach your instruction team to discuss arrangements for religious holidays. See the [campus policy regarding religious observances](#) for full details.

## **10.8 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 all public health orders in place to reduce the risk of spreading infectious disease. 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 policy on [classroom behavior](#) and the [Student Code of](#)

**Conduct.** If you require accommodation because a disability prevents you from fulfilling these safety measures, please follow the steps in the “Accommodation for Disabilities” statement on this syllabus.

As of Aug. 13, 2021, CU Boulder has returned to requiring masks in classrooms and laboratories regardless of vaccination status. This requirement is a temporary precaution during the delta surge to supplement CU Boulder’s COVID-19 vaccine requirement. Exemptions include individuals who cannot medically tolerate a face covering, as well as those who are hearing-impaired or otherwise disabled or who are communicating with someone who is hearing-impaired or otherwise disabled and where the ability to see the mouth is essential to communication. If you qualify for a mask-related accommodation, please follow the steps in the “Accommodation for Disabilities” statement on this syllabus. In addition, vaccinated instructional faculty who are engaged in an indoor instructional activity and are separated by at least 6 feet from the nearest person are exempt from wearing masks if they so choose.

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, notify the instructors on Canvas or by email at your earliest convenience, and we will make every effort to accommodate. Note that you are not required to state the nature of your illness or to provide a “doctor’s note,” nor will the instructors ever share information about your health status with the rest of the class.

For the most up-to-date syllabus statements related to special circumstances and campus policies, see [this document](#).