



The Colorado College Physics Major A Brief Overview



Get on the Mailing List today! The only way to be in the know about all departmental events, new classes, research opportunities, and jobs. “A must have,” says one physics major. “I wish I had received these emails since freshman year,” exclaims another. Don’t hesitate, **ask Kate to add you to the physics mailing list today!**

People

Faculty

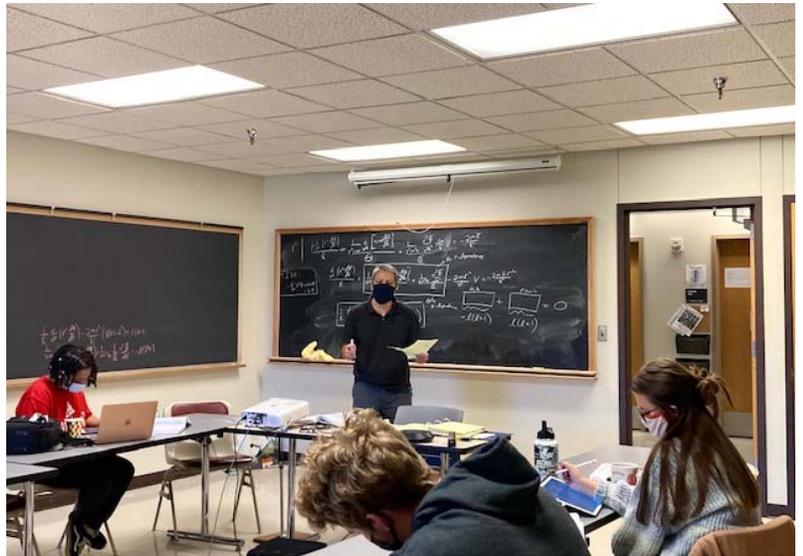
Take some time to say hi to faculty when you see them around. Majors will eventually take classes with most faculty members. Look at the Faculty/Majors board to learn more about each faculty member.

Current Faculty Members

Kristine Lang- chair
Shane Burns
Natalie Gosnell
Phillip Cervantes
Patricia Purdue
Adam Light
Dhanesh Krishnarao

Visiting Professors

Evelyn Schumer- year visiting professor
Austin Hinkel -year visiting professor
Charles Wetterer- astronomy adjunct
Juan Burciaga- summer astronomy class



Kate

The “heart of the department”, you will often see Kate in the Department office making the physics department run from behind the scenes (Barnes 230).

The word in the seminar room is “get to know Kate, she can help in so many ways. Seriously, she will always commiserate on homework, help navigate the department and will always, always feed you.”

Jeff

Our Technical Director. Jeff helps with everything technical in the department from labs to personal projects. PS: He will save you in Electronics.

Steve

The Machine Shop Director. Steve works in the basement of Olin in the Machine Shop. You can work with him directly by taking his machining adjunct.

Abby

Our current paraprofessional. She works around the department and helps with intro labs. Pop into her office (Olin 262B) anytime for life advice or questions about the major. This position opens once a year in February and is a fantastic job to stay in academia while making decisions about what comes next!

Places

Seminar room (Barnes 213)

The academic and cultural hub of student life in the physics department. A meeting place for physics students to work on homework and debate the right way to do a problem. Expect discussion, whiteboard explanations, and comradery. And tea and coffee! To get access to the room, a cubby, and a major mug, contact the paraprof.

Department (Kate's) office (Barnes 230)

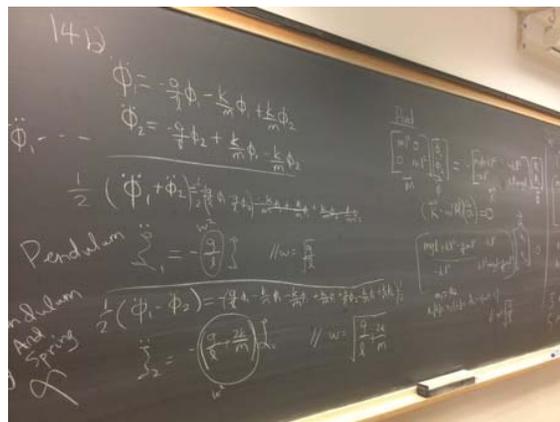
This is where you can do printing, copying, find staples, tape, etc. Oh, and snacks and conversation live here too!

Classes

As a physics major, these are the classes you will take as you progress through the major.

3-Block Intro Sequence: (You are almost finished with this!)

- Mechanics and Electricity and Magnetism (PC241/242): These classes are usually larger, and somewhat lecture based. They introduce you to most of the concepts you will continue to learn and use throughout physics at CC.
- Modern Physics (PC251): Offered third block of every year. This course introduces topics developed in or



influenced by 20th century physics. You will be introduced to special relativity and quantum mechanics.

Lab Classes:

- Electronics (PC261): You spend your days in the electronics lab making friends with resistors, transistors, and your lab partner(s). This class introduces you to laboratory techniques and builds a basic understanding of analog circuits.
- Techniques OR Observational (PC361 OR PC362): You deepen lab skills with these classes. In techniques you will work with experimental design, data collection, analysis and presentation. Observational is focused on observation techniques (mostly using the CC telescope) and data collection and reduction.



Upper-Division Classes:

Most of your classes as a major fall into this category. These classes tend to be smaller than intro classes. Class usually consists of a mix of lecture and going over problems with your classmates.

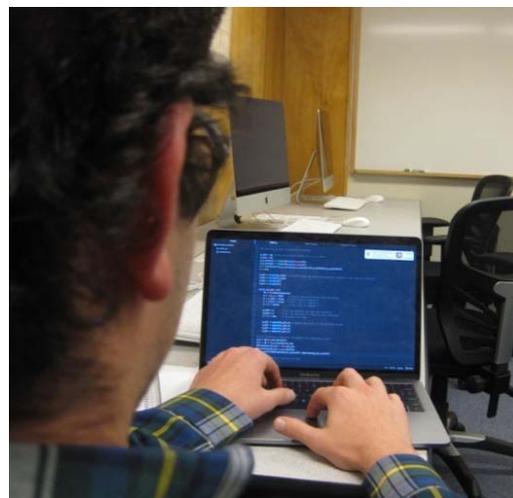
Other Fun Non-Required Electives:

- Computational Physics Adjunct (PC253): Learn how to use python to work with data.
- Machining Adjunct (PC108): Use the machine shop in the basement of Olin to create cool projects with metal, wood and plastic.
- Observational for Amateurs Adjunct (PC132): Learn how to use the Phipps observatory at CC.
- Engineering Half Block (PC210): Learn about what different kinds of engineering consist of. Usually taught by someone currently working in the field, sometimes a CC grad. This year's topic is "Development and Manufacturing of Instrumentation"



Community Opportunities

Senior Seminars: Each physics major takes a class in block one of their senior year where they develop techniques for presenting physics material. The culmination of this class is a paper and short talk they give to the department. You are encouraged to attend these presentations! Kate will be asking for RSVP's



Career Talks: We invite our majors back, once they are established in a job, to talk to us about how they got to where they are now! These talks outline their personal journey from a CC physics degree to their current position. The talks are always followed up by Q&A's. These are amazing networking experiences and informative as you navigate what's next.

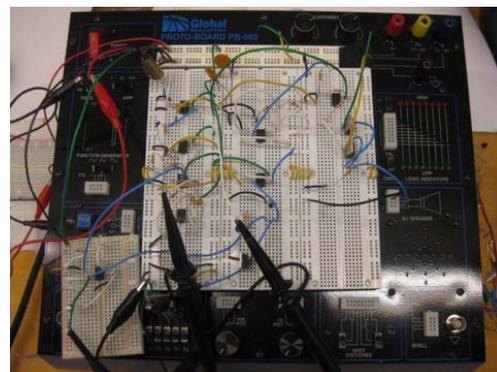
Peer-Mentoring: The department has a new peer mentoring program! We connect senior majors with students in the intro block sequence. The program aims to provide connection and support for new physics students and welcome them into the community. If you are interested in being connected with a mentor or want to know more, contact the paraprof (Abby).

Student Jobs

Grading: Several Junior and Senior majors grade homework for introductory classes each block. This is a great way to brush up on intro physics skills and work on one's own schedule. Our paraprof manages the schedule so reach out when you feel your skills are ready to start grading.

Research: Ask any physicist and they will tell you a research experience is a great idea for undergraduates and if you are considering Grad school it really is a must. Some of our faculty members host research students during the semester, in a research block or during the summer. If you are intrigued by the research interests of a faculty member talk to them early in the year about opportunities to work with them. See bottom of packet for information about faculty research interests!

There is an REU workshop every year. This year, Dr. Light will host the workshop. You will help you explore your options and craft your resume and application materials.



Faculty Research Interests

Dr. Light

- My research centers on atmospheric pressure plasma physics and its applications. Our plasmas are unique in that neutral atoms and ions are near room temperature while electrons have enough energy to break chemical bonds ($\sim 10^4$ K). We are currently studying the breakdown of polyfluoroalkyl substances (PFAS) and the modification of surface chemistry using plasma jets. Our work often involves mechanical and electrical design as well as collection and analysis of data.
- I typically have one block of research for credit during the school year and take several students for paid research during the summer.
- Depending on funding, 2-4 students is typical.

Dr. Gosnell

- I am an observational astrophysicist. My research focuses on telling the stories of binary stars, specifically focusing on how the evolution of a star can be changed by being in a binary system. My group uses data from ground- and space-based telescopes to identify and more fully understand these binary stars. We use Python code to analyze our data and compare against theoretical models.
- I typically have one research block during the year and hire research students for the summer.
- Depending on funding, I can work with 2-4 students per year.

Dr. Krishnarao

- I'm most interested in trying to understand how our Galaxy, the Milky Way, evolved to its current state. I frequently use observations of spectra from a ground-based telescopes in Chile (called WHAM!), or the Hubble Space Telescope, to search for gas in and around galaxies. I also enjoy digging through archives to make the most out of older observations with new techniques, like machine learning and AI.
- I hope to work with 3-4 students starting next year.

Dr. Cervantes

- I am looking for students who have taken PC 251 and PC 261 to work on building/developing the prototype of an inexpensive Fourier Transform Interferometer designed specifically for small samples. You'll learn about optics, spectroscopy, computer interfacing, machining (mostly designing), troubleshooting, Googling, and reading catalogs. You'll work independently mostly, and possibly with one other student.
- I normally do research during the regular school year. Students should contact me via email if they are interested.
- I usually ask for a pair of physics majors.

Dr. Burns

- I'm working on measuring the brightness of the night sky in support of a proposal for the dark sky reserve in the San Luis Valley. The work will involve assembling a Sky Quality Meter measurement system, programming the data acquisition, and analysis software. We will also need to use GIS software to map our results. The research will involve a few trips to the Baca campus.
- I would like to have two or three students help me with this work during the academic year.

Dr. Lang

- I am working on developing content for both a biophysics course and a biophysics textbook. The textbook project is just getting started, so things are little up in the air, but I envision hiring a student to help research resources for the scope of the textbook and/or to write homework problems for chapters that are scoped.
- Research opportunity would primarily be in the summer 2022, but some work could get started in springs 2022 if time permits
- I anticipate taking one or two students.

Dr. Purdue

- My research is concerned with the detection of gravitational waves from astronomical systems, such as colliding black holes or neutron stars. This field provides a variety of different types of student projects. A recent student project involved modeling gravitational waves from elliptical binary systems; there are possibilities to build on that type of work. There are also opportunities to do engineering-oriented projects, such as examining to what extent re-positioning a communications antenna on a spacecraft might affect the spacecraft's gravitational-wave sensing systems. *Prior knowledge of general relativity, gravitational waves, and/or coding are not required for many of these potential projects.*
- I have an Investigations block available this year. I usually take 1-2 students for this block. There might be other opportunities for research during the summer, but this is not decided yet. Please contact me for more information about the investigative block or other possible opportunities.