WELCOME! to "Black Holes". This is a lower division course whose goal is to introduce some of the most exciting topics in modern astronomy and physics: the nature of black holes, the evidence for their existence, and their role in the Universe. Along the way we will study modern ideas about the nature of space, time, and gravity. This course is approved for the Arts and Sciences Core Curriculum: Natural Sciences. It does not require any CU course prerequisites. The course material will involve extensive high school math and science, though at a fairly elementary level. Expect it to be challenging, but primarily at a conceptual rather than mathematical level.

Course topics

1. What are black holes?
2. How did Einstein change our conception of space and time?
3. What is the evidence that black holes really exist?
4. What role do black holes play in the Universe?
5. Testing physics in the extreme environment of black holes

Contacts

Prof Phil Armitage
Office JILA A909
email: pja@jilau1.colorado.edu
phone: 303 492 7836

Office hours: Tuesday and Thursday 11am-noon. You are very welcome to stop by to discuss the class at other times, but it’s best to email first to check I’ll be in the office.

TA Thomas Rogers
email: thomas.rogers@Colorado.EDU

Office hours: MWF 2-3pm after class. MF in Duane E122, Wednesday in the Astronomy Help Room Duane D220

Lectures

Monday / Wednesday / Friday, 1:00-1:50pm, Duane G130. I will respect your schedules by finishing class on time, in return please do not disrupt your fellow students by leaving early. Phones must be switched off, and the only acceptable use for laptops and tablets is for taking notes. I will be posting copies of the lecture notes on the class web site and on D2L.
Textbooks

"Gravity's Fatal Attraction: Black Holes in the Universe", 2nd Edition, Mitchell Begelman and Martin Rees. This is an easy read, and although it does not include any math at all if you understand all the concepts well you should be in good shape for the class.

"Black Holes and Time Warps", Kip Thorne. This book, by one of the world's foremost experts on relativity (and the original screenwriter for Interstellar!), covers special and general relativity at about the same level as the class. It also includes sections on the most bizarre possibilities allowed by relativity, along with personal accounts of how the reality of black holes came to be accepted during the 1960s and later.

Grading

Your final grade will be based upon:

40% - two midterms (20% each), on Feb 15th and Mar 18th
30% - the Final, on Wednesday May 4th 4:30-7:00pm
30% - five or six homeworks, your lowest score will be dropped

Extra credit

I'm not a historian, and we won't be saying much about how Einstein developed his theories of relativity (and we won't say anything about his life and political views). Needless to say, the handful of years that Einstein spent developing relativity were only a small part of his life, which was incredibly rich and complex. If you're interested in this aspect I highly recommend:

"Einstein: His Life and Universe" by Walter Isaacson

Up to 5% extra credit is available for reading and reviewing this book. Book reviews for extra credit (in the style of a book review, up to 1000 words) should be submitted no later than April 22nd, in class.

General policies

We will be following the standard University policies summarized below. In a large class such as this, experience shows that a few people will run into problems of various kinds, whether they be difficulties keeping up academically, pressure of work from other classes, or personal or medical difficulties. I encourage you to inform me as soon as possible if you are having trouble; it is almost always easier to help during the semester rather than after final grades have been posted!

Thomas will be responsible for keeping track of the grades and maintaining the online records on D2L.
Accommodation For Disabilities

If you qualify for accommodations because of a disability, please submit a letter from Disability Services in a timely manner (for exam accommodations provide your letter at least one week prior to the exam) so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities. Contact Disability Services at 303-492-8671 or by e-mail at dsinfo@colorado.edu. If you have a temporary medical condition or injury, see Temporary Injuries guidelines under the Quick Links at the Disability Services website and discuss your needs with your professor.

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 let me know in advance of any conflicts.

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 differences of race, color, culture, religion, creed, politics, veteran’s status, sexual orientation, gender, gender identity and gender expression, age, disability, and nationalities. Class rosters are provided to the instructor with the student’s legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. For more information, see the policies on classroom behavior and the student code.

Discrimination And Harassment

The University of Colorado Boulder (CU-Boulder) is committed to maintaining a positive learning, working, and living environment. CU-Boulder will not tolerate acts of sexual misconduct, discrimination, harassment or related retaliation against or by any employee or student. CU’s Sexual Misconduct Policy prohibits sexual assault, sexual exploitation, sexual harassment, intimate partner abuse (dating or domestic violence), stalking or related retaliation. CU-Boulder’s Discrimination and Harassment Policy prohibits discrimination, harassment or related retaliation based on race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Individuals who believe they have been subject to misconduct
under either policy should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127. Information about the OIEC, the above referenced policies, and the campus resources available to assist individuals regarding sexual misconduct, discrimination, harassment or related retaliation can be found at the OIEC website.

**Honor Code**

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the academic integrity policy of the institution. Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access, clicker fraud, resubmission, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code Council (honor@colorado.edu; 303-735-2273). Students who are found responsible of violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code Council as well as academic sanctions from the faculty member. Additional information regarding the academic integrity policy can be found at http://honorcode.colorado.edu.