

ASTR 3830: Astrophysics 2 – Galactic and Extragalactic
<http://jilawww.colorado.edu/~pja/astr3830/>

TIME & PLACE: Tuesday / Thursday 11:00 – 12:15 am, Duane G131

INSTRUCTOR: Phil Armitage

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OFFICE: JILA tower A909, phone 303 - 492 – 7836. My mailbox is on the second floor of the tower, at the JILA reception.

AIMS OF THE COURSE: This course follows on from ASTR 3730 to form a year-long introduction to astrophysics. The aim is to show how mostly elementary physical principles can be applied to work out what's going on in a diverse range of astronomical objects, which this semester will include galaxies, supermassive black holes, and the Universe as a whole. After a couple of classes of overview we will cover:

1. **The Milky Way galaxy** – including the different components of our own galaxy and discussion of how stars interact with each other.
2. **Supernovae, compact object mergers**, and the origin of chemical elements.
3. **'Normal' galaxies** – the classification and properties of spiral, elliptical and irregular galaxies.
4. **Active galaxies** – the properties of galaxies where the emission from ordinary stars is overwhelmed by emission from gas falling in to a supermassive black hole in the nucleus.
5. **Galaxy clusters**
6. **Cosmology** – structure and evolution of the Universe on the largest scales.

CONTACTING ME: 'Official' office hours are 2:00 – 3:00 pm Tuesday and Thursday. You are, however, welcome to stop by my office any time I'm there to discuss the class and / or homework. Afternoons are normally best. I normally answer email queries promptly.

PREPARATION: No prior knowledge of extragalactic astronomy or cosmology is necessary for this course. ASTR3730 (or equivalent at a different university) is a prerequisite for this class, and you should also have taken or be taking Calculus 3. Knowledge of some of the material covered in ASTR3730 - in particular the properties of black body, bremsstrahlung and synchrotron radiation, and the basic evolution of stars of different masses – will be assumed or only *briefly* reviewed. Mathematically, we will make extensive use of algebra and basic calculus throughout the course, but we will not introduce any concepts from vector calculus.

EXAMS: The Final exam for this course will be on Wednesday, May 9th, at 4:30pm. The midterm will be on Thursday, March 8th, in class.

HOMEWORK: There will be regular written problem sets, which will be graded and count toward the course grade. Together with the midterm and final exam, these will be the main test of how well you've understood the different parts of the course material. You are encouraged to work collaboratively on the problem sets, on the understanding that the answers you submit must be "your own work" (i.e. if asked "why did you do that?" at some point in a problem, you could answer!). I reserve the right to deduct points for late solutions to homework.

GRADING: The course grade will be determined based upon the homework (40%, your worst homework grade will be discarded and not count), 1 midterm (20%) plus the Final (40%). Conversion from numeric to letter grades will be based on a curve. I will provide some guidance on this conversion once we've done a few problem sets, so that you have an idea of how things are going.

BOOKS: "Astrophysics in a Nutshell" by Dan Maoz or "An Introduction to Modern Astrophysics" by Bradley Carroll and Dale Ostlie are two books that cover some of the material in Astrophysics 1 and 2. Both are more focused toward Galactic astrophysics, but there isn't a better book at this level for Astrophysics 2 that I'm aware of. I won't lecture from either book, but you may find one or the other useful at times as a reference.

ACCOMMODATION FOR DISABILITIES: If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member 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](http://www.colorado.edu/disabilityservices/students) (www.colorado.edu/disabilityservices/students). 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](#) under the Students tab on 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, see me or drop me an email. See the [campus policy regarding religious observances](#) for full details.

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. 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 of Conduct](#).

SEXUAL MISCONDUCT, DISCRIMINATION, HARASSMENT AND/OR RELATED RETALIATION: 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](#). Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, 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 for 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 the [Honor Code Office website](#).