

# ASTR 2010-001: MODERN COSMOLOGY

**Syllabus: FALL 2019**

**Lectures: MWF, 1:00-1:50 am, Duane G131**

**Online material accessible at CU Canvas:**  
<https://canvas.colorado.edu/>

**Contact Information:**

**Prof. Mitchell Begelman**  
**Room A-808, JILA Tower**  
**Email: [mitch@jila.colorado.edu](mailto:mitch@jila.colorado.edu)**  
**Phone: 303-492-7856**

Office hours: 11-12 Monday and Wednesday, or by appointment (send me an email and I will respond ASAP)

**This class does not have a TA**

**Course Description:**

This class offers an introduction to cosmology, intended primarily for non-science majors. The overall goal is to familiarize students with current astronomical views on the origin and evolution of the universe. We will discuss current evidence for the expanding and evolving universe and its contents (stars, galaxies, gas, radiation, dark matter, dark energy). By the end of this semester, you should be able to critically evaluate news articles written on these topics. This course is approved for the Arts & Sciences General Education Distribution Requirement in Natural Sciences.

**Prerequisites:**

No CU course prerequisites. Course material will involve basic algebra, trigonometry and quantitative reasoning at a level commensurate with CU admission standards. You will frequently need to work with physical units, scientific notation and proportional relationships.

**Topics to be covered include:**

- A brief history of astronomical cosmology
- The scientific method (applied to cosmology)
- Matter, light, stars, and galaxies
- The nature of space and time
- The expansion of the universe and Big Bang Theory
- Dark matter and dark energy
- Matter, radiation, and galaxies in the early universe
- The cosmic microwave background radiation
- Observational cosmology (confronting theory with evidence)
- Multiverses and anthropic principles

**Required Text:**

*Your Cosmic Context: An Introduction to Modern Cosmology*, by Todd Duncan & Craig Tyler (Pearson Addison-Wesley). We will follow this text fairly closely.

There will be a copy of the textbook on reserve at the library.

**Additional Resources:**

**Classnotes**, in Powerpoint and pdf format, will be posted on the Canvas course site.

**An introductory astronomy textbook:** Although all concepts needed for this class will be covered in lecture, you may find this useful for filling in details not covered adequately in Dencan & Tyler, especially if you have not taken college-level astronomy before. I recommend *The Cosmic Perspective* (Bennett, Donahue, Schneider, and Voit), especially during the first third of the course. The book is expensive to purchase new (and I am not recommending this), but it is widely used on the CU campus and around the nation, so you should be able to find a used copy or borrow one from a friend or the library (preferably 7<sup>th</sup> edition or later).

Ned Wright's [Cosmology Tutorial](#), written by Ned Wright of UCLA, for those of you who wish to read about cosmology in more detail. This site is complete with Frequently Asked Questions, News of the Universe, Cosmological Fads and Fallacies, even sections on "Cosmology and Religion" and "Cosmology and Art".

**Additional assigned reading:** From time to time, articles will be assigned as supplementary reading or in connection with writing assignments. These will be supplied through links on the Canvas site.

### **Course Requirements and Grading Policy:**

**Exams:** There will be three midterm exams, scheduled for Wed. Sept. 25, Wed. Oct. 23, and Wed. Nov. 20. The exams will cover material discussed in class and in the assigned reading, and will consist of a mixture of short-answer and short essay questions. Emphasis will be on concepts and major themes, rather than rote memorization of details. There will be a cumulative final exam on Tue. Dec 17 at 4:30-7:00 pm.

**Homeworks:** There will be 5 homework assignments requiring you to do elementary math (e.g., evaluating and interpreting formulae) and/or write brief discussions of concepts from the course. Anticipated due dates for the homeworks are Mon. Sept. 9, Wed. Oct. 2, Wed. Oct. 30, Mon. Nov. 11, and Wed. Dec. 4. The assignments will be posted online *at least* a week in advance (hard copies available on request) but must be handed in as hard copies in class, no later than the due date.

**Writing exercises:** There will be 5 writing assignments consisting of short essays (composed with a word-processor, approximately 500 words not counting references). You may be asked to interpret images, or to read and discuss short popular-level articles (from newspapers, magazines, press releases, websites, etc.) about recent cosmological discoveries. Anticipated due dates for the homeworks are Wed. Sept. 11, Fri. Oct. 4, Fri. Nov. 1, Wed. Nov. 13, and Fri. Dec. 6. The assignments will be posted online *at least* a week in advance (hard copies available on request) but must be handed in as hard copies in class, no later than the due date.

**Warning:** You are encouraged to form study groups and to discuss the course material with your classmates, but we expect the work you submit to be your own. We will be on the lookout for plagiarism. Detection of plagiarism or other forms of cheating will carry the **minimum** penalty of an automatic "F" for the assignment.

### Grading:

Grading will be weighted as follows:

<b>Item</b>	<b>Date</b>	<b>Weight</b>
Midterm exam 1	Wed. Sept. 25	15%
Midterm exam 2	Wed. Oct. 23	15%
Midterm exam 3	Wed. Nov. 20	15%
Final exam	Tue. Dec. 17 4:30-7:00 pm	25%
Homeworks	5 spread through term	25%
Writing assignments	5 spread through term	25%

If you add that up, it comes to 120%. To make it add to 100%, I will delete the worst 20% from the exams. This means that you can do badly on one of the midterms and it won't count at all (plus I will knock 5% off the value of your next worst exam). If you do badly on the final, it will count only 5%. This offer does not apply to the homeworks or writing assignments, which will count fully.

### General policies:

We will be following the standard University policies summarized below. In a large class such as this, it is unfortunately guaranteed that a few people will run into problems of various kinds, such as 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!

### Accommodations for students with disabilities:

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to me in a timely manner so that your needs can be addressed (for exam accommodations provide your letter at least one week prior to the exam). 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.

### Religious observances:

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. Please notify me as

soon as possible if any conflicts arise. 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](#).

**Please switch off phones; laptops and tablets should only be used for taking notes.**

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

The University of Colorado Boulder (CU Boulder) is committed to fostering a positive and welcoming learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct, intimate partner abuse (including dating or domestic violence), stalking, 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](mailto: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 instructors have a responsibility to inform OIEC when made aware of incidents of sexual misconduct, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about options for reporting and support resources.

### **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, 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 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](#).