

33-777: Introductory Astrophysics

Dr. Duncan Campbell

Spring, 2020

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Office Hours: by appointment
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Class Hours: Tuesday/Thursday 1:30-2:50pm
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Course Description

This course provides an introduction to modern astrophysics, focusing on the structure and evolution of "building blocks" on several different scales: interstellar medium, planets, stars, galaxies, and the Universe as a whole. It begins with a general overview of the physical, mathematical, and observational tools used in the modern study of astrophysics. The second unit then covers the internal structure and evolution of stars, including the exotic end-products of stellar evolution (white dwarfs, neutron stars, black holes). The third and final unit covers galactic and extra-galactic astronomy, and provides an introduction to modern cosmology.

Course Materials

An Introduction to Modern Astrophysics, by Carroll Ostlie, 2nd Edition, Pearson, Addison-Wesley, 2007 (ISBN 0805304029)

No textbook is *required* for this course, and various resources beyond the above textbook will be used to prepare this course. Further resources will be noted throughout the course.

Prerequisites

There are no formal prerequisites for this course. A typical background in undergraduate physics will be assumed.

Course Objectives

The primary goal of this course is to introduce students to the tools and concepts that are central to modern astrophysical research.

By the end of the semester, students should be able to explain how astrophysicists have arrived at the current understanding of phenomena that include the following:

- celestial mechanics (motions of objects in the sky)
- blackbody radiation
- the origin of spectral lines
- stellar spectra
- radiative transfer
- formation and evolution of stars, including exotic end products
- clusters of stars
- clusters of galaxies
- structure of the Milky Way
- properties of other galaxies
- formation and evolution of galaxies
- structure and dynamics of the Universe as a whole

Lectures and Readings

Lectures are intended to introduce, discuss, clarify, and elaborate on the material and concepts of the course. Recommended reading assignments and resources will be announced during each class period and are intended to identify material that will be covered during the next lecture(s). It is essential that students prepare outside of the lectures. This course is intended to be a collaboration between student(s) and instructor.

Assignments

Take-home assignments will be announced in class. While these assignments should be completed by each individual student, working with your colleagues is encouraged.

Exams

There will be one oral exam during the semester. This exam will be conducted one-on-one, and tests a general understanding of the material covered in the course. These will be scheduled with each student individually.

Final Project

Each student will complete a written report and an oral presentation in class on a topic in the field of astrophysics. This topic will be chosen in consultation with the instructor.

Course Help

The instructor will be available for meetings with students on an appointment basis. Requests for appointments should be made at least 24 hours in advance.

Grades

Final grades will be calculated with the following components:

- engagement during lectures 10%
- homework/projects: 50%
- exams: 30%
- final project: 10%

Course Policy

No make ups of any kind will be given, and late homework will not be accepted. Any excuses of any kind will only be considered with proper official documentation. Students are strongly encouraged to interact with each other and the instructor, but any work submitted by students must be fully their own. Cheating, plagiarism, or copying of any kind will not be tolerated.

Diversity and Inclusion

I consider this class to be a place where you will be treated with respect, and I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability - and other visible and non-visible differences. All members of this class are expected to contribute to a respectful, welcoming, and inclusive environment for every other member of the class.

Accommodations for students with disabilities

If you have a disability and have an accommodations letter from the Disability Resources office, I encourage you to discuss your accommodations and needs with me as early in the semester as possible. I will work with you to ensure that accommodations are provided as appropriate. If you suspect that you may have a disability and would benefit from accommodations but are not yet registered with the Office of Disability Resources, I encourage you to contact them at access@andrew.cmu.edu.

University Policy on Cheating and Plagiarism

Students at Carnegie Mellon University are engaged in preparation for professional activity of the highest standards. Each profession constrains its members with both ethical responsibilities

and disciplinary limits. To assure the validity of the learning experience, a university establishes clear standards for student work. In any presentation, creative, artistic, or research, it is the ethical responsibility of each student to identify the conceptual sources of the work submitted. Failure to do so is dishonest and is the basis for a charge of cheating or plagiarism, which is subject to disciplinary action.

For the purposes of this course, cheating includes, but is not limited to:

1. Plagiarism, explained below.
2. Submission of work that is not the student's own for papers, assignments or exams.
3. Submission or use of falsified data.
4. Theft of, or unauthorized access to, an exam.
5. Use of an alternate, stand-in, or proxy during an examination.
6. Use of unauthorized material including textbooks, notes, or computer programs in the preparation of an assignment or during an examination.
7. Supplying or communicating in any way unauthorized information to another student for the preparation of an assignment or during an examination.
8. Collaboration in the preparation of an assignment. Unless specifically permitted or required by the instructor, collaboration will usually be viewed by the university as cheating. Each student, therefore, is responsible for understanding the policies of the department offering any course as they refer to the amount of help and collaboration permitted in preparation of assignments.
9. Submission of the same work for credit in two courses without obtaining the permission of the instructors beforehand.

Plagiarism includes, but is not limited to, failure to indicate the source with quotation marks or footnotes where appropriate if any of the following is reproduced in the work submitted by a student:

1. A phrase, written or musical.
2. A graphic element.
3. A proof.
4. Specific language.
5. An idea derived from the work, published or unpublished, of another person.