

**Astronomy 300A**  
**Dynamics and Mechanics in Astrophysics**  
**(Fall 2019)**

**Lectures:** 11:00AM-11:50AM MWF in Steward 204

**Instructor:** Prof. K. Kratter

**Office:** SO N328 (emphasis on the N)

**Class Email:** astr300a@list.arizona.edu

**Prof. Kratter's Office hours:**

1:30-2:30PM Wednesdays

**TA:** Pedro Espino

**Office Hours:**

Parker Library: Mondays 12PM - 1PM as ATOMM

in office: Fridays 10AM-10:45AM in PAS 344 and by appointment

### **Course Description**

In this course we will survey the role of gravity in astrophysics. We will begin with the study of simple Keplerian orbits, and then explore progressively more complex dynamical systems. We will cover hydrostatics and a short introduction to astrophysical fluid dynamics towards the end of the semester. This class will focus heavily on problem solving skills including the use of dimensional analysis and order of magnitude reasoning. We will also touch on computational methods for problem solving throughout the semester.

#### **Topics to be covered**

Dimensional Analysis  
Order of Magnitude Reasoning  
Stellar & Planetary dynamics  
Galactic dynamics  
Atmospheres  
Fluid Dynamics

**GRADING:** Your course grade will be based on:

- Homework: 25% (drop lowest score)
- In class activities / problem solving: 25% (drop lowest two scores)

- In class tests : 35%
- Semester Project: 15%

The class will not be curved. The correspondence between final percentages and letter grades will be: **A:** 87% – 100%; **B:** 72% – 87%; **C:** 50% – 72%, **D:** 30% – 50%; **E:** 0% – 30%.

**TEXTBOOK** For this course we will primarily use “Principles of Astrophysics,” by Charles Keeton. This book is available for **FREE** from the UofA online library system as a PDF document. You can find it [online here](#). I also recommend looking at ”The Tapestry of Modern Astrophysics,” By Steven Shore. This book is also available as an online PDF [here](#). You will find a different treatment of the same material. We will rely more heavily on the latter book for the portion of the course on fluid dynamics.

Although it is **NOT REQUIRED** for the course, I also recommend Frank Shu’s “Physics of Astrophysics.” This is available in [multiple campus library locations](#). For this course, the gas dynamics volume is most relevant. Other supplementary material will be provided online throughout the semester.

**MIDTERM TESTS** There will be three in class tests during the semester. No makeup tests without a prior approved Deans Excuse. They are tentatively scheduled for:

**Monday, September 30th**  
**Wednesday October 30th**  
**Friday, December 6th**

**SEMESTER PROJECTS** In lieu of a final exam, students will carry out a small research project during the course of the semester. Students will work in groups of two or three to pick a journal article (or two) related to the course material. Each group will give a presentation of the article and develop a related problem set for the rest of the class to solve. More information will be given during the semester.

### **Course Conduct and Expectations**

Please come to class ready to learn and engage with your peers. While there is no mandatory attendance policy, participation and in-class activities make up a substantial portion of your final grade. We will be doing a lot of in class problem solving. In order to ensure a productive learning environment for all students, please note the following class rules:

1. NO cellphones in class. They must be kept in a bag or pocket and on silent.
2. Laptops / tablets ONLY for note taking.
3. No class disruptions (talking, note passing, etc).
4. Obey the University of Arizona Code of Academic Integrity: [available here](#)

5. Follow the University of Arizona Non-threatening behavior policy: [available here](#)
6. Adhere to the University of Arizona nondiscrimination and anti-harassment policy: [available here](#)

**Course Email and Websites:**

In this class we will make regular use of D2L . It is your responsibility to check D2L regularly for course notifications / updates / and assignments.

**Email:** All emails regarding the course should be sent to [astr300a@list.arizona.edu](mailto:astr300a@list.arizona.edu). Expect response times of 48 hours or less. This email address goes to both the instructor and the TA.

**Course Updates:** The information contained in the course syllabus and schedule, other than the grade and absence policies, may be subject to change with reasonable advance notice.

**Students with disabilities** At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, <https://drc.arizona.edu/>) to establish reasonable accommodations.