

Astronomy 496/596 APA

The Art and Practice of Astronomy

Fall Semester 2016

Astronomy 134 Thursday 4:00–4:50 pm

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Office Hours: by appointment

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Course web page URL

<http://go.illinois.edu/astr596apa>

1 Introduction

A career in astrophysics research calls upon many skills, and requires negotiation of many institutions, professional practices, and unwritten rules. These skills are usually not taught in traditional graduate classroom instruction at Illinois or elsewhere. Consequently, students often have uneven and haphazard exposure to these skills and issues.

This course is intended to address this gap in student preparation. It is our goal that students will become familiar with some of the tools, opportunities, expectations, and challenges of a career in astronomy and astrophysics research.

2 Course Structure

Class time will be divided between science and pre-professional instruction.

2.1 Science

For about half of the time, students will collaborate interactively to address open-ended research questions qualitatively and quantitatively, using order-of-magnitude and dimensional analyses. Students will develop confidence and experience in using quantitative estimates to gain qualitative insight into astrophysical problems. Students will see how these rough estimates frame research questions and identify fruitful avenues ripe for more careful study (and fruitless areas to avoid!).

We will also spend time discussing the next week's colloquium. The goal is to provide students with a little bit of additional background information so that they can engage more fully with the talk.

2.2 Professional

The rest of the course meetings will focus on professional preparation and skills which will help students to plan and begin successful careers in research astrophysics. The goal is to provide information on the expectations, opportunities, and institutions at the heart

of astrophysics, and to offer strategies for negotiating and thriving in this professional environment.

A list of anticipated topics follows; these will be modified—and added to—based on student interest.

Anticipated Topics

Charting Career Trajectories

- ethics and integrity
- professional behavior and anti-harassment

The Graduate Experience

- interacting with faculty
- choosing and working with an Advisor
- milestones: prelim, thesis, defense
- reading papers and keeping up with the field
- writing papers
- collaboration and co-authorship
- interacting with colleagues: conferences, seminars
- CV writing, maintenance, and reading

The Postdoctoral Experience

- the rumor mill
- finding the job, getting the job
- habits of highly successful postdocs

The Faculty Experience

- types of institutions, jobs
- faculty job search, applications, job talks
- dual-career couples
- tenure and promotion
- rank, its privileges and problems
- grants: funding agencies; developing a fundable project, writing grant proposals
- teaching

Alternatives to Academia

- national laboratories/observatories
- planetariums
- industry
- non-profits

3 Course Requirements

Grading is pass/fail (“S” or “U”), and is heavily based on class attendance and *participation* which is crucial for the success of the course. At each class meeting, class attendance will be taken, and participation will be judged, based on active engagement, not on correct responses.

Brief homework exercises will be assigned roughly weekly. The work level will be intended to reflect the 1 unit of course credit.

Attendance, participation, and homework are pass-fail. To pass, you will need $> 75\%$ attendance, $> 50\%$ participation, and $> 75\%$ on the homeworks. Thoughtful answers on homeworks will receive full credit, even if incorrect.

4 Text

There is no required text for this course, and indeed for much of the material in the course, no text exists. For those interested in further reading and practice on back-of-the-envelope estimation, we recommend the following:

Lawrence Weinstein and John A. Adams *Guesstimation*, Princeton U. Press (2008)

This is a recent, very accessible, well-written, entertaining, and elegant presentation of order-of-magnitude estimation. It contains many interesting and topical order-of-magnitude problems, some of them astrophysical. The intended audience is not assumed to know a great deal of physics, so some techniques (such as dimensional analysis) are beyond the scope of the book.

Other relevant discussion is linked on the course webpage.

5 Astronomy 496 APA

Students registered with ASTR 496 APA will participate in the same class meeting and homework, but will be judged by standards of advanced undergraduates. Full and active participation is still necessary, expected, and required.

Note also that the some of the professional discussion will explicitly targeted for senior undergraduates, for example: whether to go to graduate school, how to choose where to apply, and how to write successful applications.