

PHYS 561 - ASTRONOMY AND ASTROPHYSICS FOR EDUCATORS: SYLLABUS

Fall, 2014; Section 401, Call # 82304; W 5-7:30pm

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LOCATION: MPLX 214

OFFICE HOURS: I will make time for questions about homework problems or anything else at the end of each class. I will also reply to questions over email within 24 hours.

TEXTBOOK: *Astrophysical Concepts* by Martin Harwitt, ISBN-13: 978-0387329437

STUDENT LEARNING OUTCOMES:

- Students will demonstrate understanding of the nature of the information carried in the light from stars and how it allows us to infer their structure and evolution.
- Students will demonstrate knowledge of the properties and life cycle of stars of different masses, and how they relate to the Hertzsprung-Russell diagram.
- Students will demonstrate knowledge of the structure of galaxies of different types, and how they organize on large scales.
- Students will demonstrate knowledge of the big bang model of the universe, and three main pillars of evidence on which it stands.
- Students will be able to exercise their knowledge in communicating cutting-edge astronomical science at a level appropriate for high-school students and the public, and be able to draw from resources set up to aid that communication.

COURSE DETAILS

This class concerns the study of the properties and physics of astronomical objects, from stars to galaxies to the universe as a whole. Astronomy and Astrophysics is probably the area of physics which captures the public imagination the most; the latest discoveries and breakthroughs are routinely reported in the popular media, sometimes without a full appreciation of the implications, or limitations, of the discovery. As educators it is important that we are able to accurately address such astronomical topics as they arise, particularly when curious students ask about them. Astrophysics is a unique branch of physics in which the objects of study are not accessible to controlled experimental investigation in the laboratory; it is an *observation* driven science. As such, it is important to understand the basics of *how* we know the properties and processes of astronomical objects, and have a good overview of the current state of astronomical knowledge. In this class we will see that we actually know in great detail a vast amount about our universe and its constituents. But how do we know the distances, sizes and chemical composition of stars and their exotic remnants, neutron stars and black holes? How do we know in great detail the life cycle of stars, driven by thermonuclear processes deep in their cores? How do we know the size of our galaxy, the fact that galaxies are, on average, moving away from each other, the age and size of the visible universe? These will be the topics addressed in this course. We will cover the basic physics governing astronomical objects and processes, but we will also explore ways of conveying the properties of the universe and its constituents to a general audience. We will also make use of citizen science projects which involve the public in the analysis of astronomical data.

CLASS REQUIREMENTS: The main mathematical requirements will be algebra, calculus and occasionally ordinary differential equations. For the latter, background material will be presented in class. Access to computer and internet connection will also be necessary.

ASSIGNMENTS AND GRADING:

(The following is to be taken as *quite* tentative).

There will be homework assignments most weeks. Some will involve working through example calculations of astrophysical properties. Some will involve writing up explanations of certain astrophysical phenomena in the form of a popular science article. There will be in-class assignments to reinforce certain important concepts. There will be occasional longer projects that will be completed over the course of 3-4weeks, in lieu of tests. Grading will roughly break down as:

50% Homework assignments
30% Projects
20% Participation (attendance/in-class assignments)

ADA STATEMENT: The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact:

Office of Student Disability Resources and Services
Texas A&M University-Commerce
Gee Library
Room 132
Phone (903) 886-5150 or (903) 886-5835
Fax (903) 468-8148
StudentDisabilityServices@tamuc.edu

UNIVERSITY POLICIES

- All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment. (See Student's Guide Handbook, Policies and Procedures, Conduct). Rude or disruptive behavior will NOT be tolerated.
- Texas A&M University-Commerce does not tolerate plagiarism and other forms of academic dishonesty. Conduct that violates generally accepted standards of academic honesty is defined as academic dishonesty. "Academic dishonesty" includes, but is not limited to, plagiarism (the appropriation or stealing of the ideas or words of another and passing them off as one's own), cheating on exams or other course assignments, collusion (the unauthorized collaboration with others in preparing course assignments), and abuse (destruction, defacing, or removal) of resource material.

CLASS SCHEDULE:

Here is a tentative schedule for the class:

Subject	Class
Overview of the universe: how big is it, and what's in it?	1-2
Light from stars: black body, emission and absorption spectra	3-4
Stellar structure, composition and distances	5-7
Galaxies and galaxy clusters	8-9
Cosmology: the study of the universe as a whole	10-11
Other topics: exoplanets, solar system formation	12-14