Spring 2-1-2018

ASTR 132N.01: Stars, Galaxies, and the Universe

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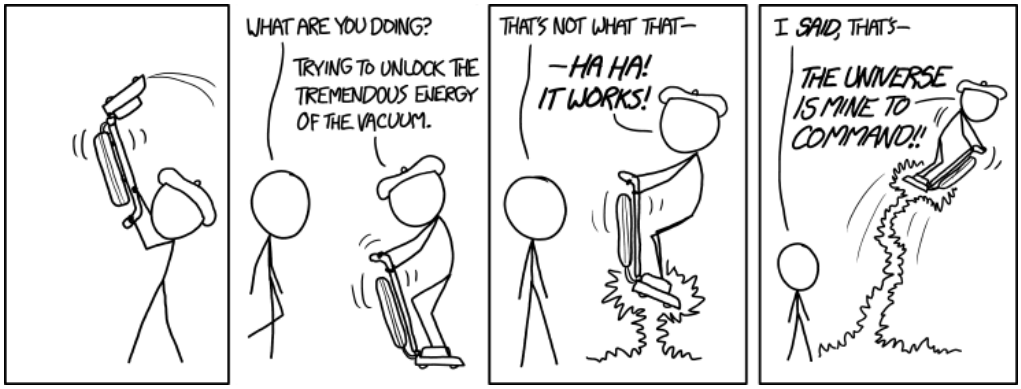
ASTRO 132 – Stars, Galaxies, and the Universe *Spring 2018*

Instructor: Mark Reiser
Class Times: T, R: 9:30 – 10:50
Room: Urey Lecture Hall 1
My Office: CHCB 120 e-mail: mark.reiser@umontana.edu
Office Hours: T 11-12, W 10-11, R 1-2, **or by appointment**



Credit: XKCD

Course Description

This course is designed to provide an introduction to some of the most fundamental and exciting concepts in astronomy, with a particular emphasis on all things extrasolar (ie., outside our solar system). We will cover topics such as the dynamics of the night sky, stars, galaxies, and the universe as a whole.

But as you are in the course, I want to emphasize that astronomy is not simply a collection of facts, theories, and scientific discoveries. Astronomy is a *process*. Science, in general, is one possible method for asking questions about the universe. It is a systematic process whereby we hope to gain a better and better understanding of how the universe behaves.

Objectives

- Appreciate the scientific process and how it works.
- Develop familiarity with the night sky and how it changes with time and position on Earth.
- Work with classmates to arrive at a deeper understanding of astronomical concepts and processes.
- Understand certain basic physical laws, and the processes that govern astronomical quantities.
- Explore the variety of observed objects in the universe, and their relationships to one another.
- Infer the nature, scale, structure and evolution of the universe, and objects therein.

Attendance

Attendance to class is **STRONGLY ENCOURAGED**. Many weeks, I will be taking attendance during lecture. I will likely do this about 50% of the time. These days will be at random, and often in the form of short questions I ask of the class, to be handed in on a small sheet of paper.

If you need to miss class on the date of a semester exam, we can simply drop that exam grade (see grading). If you have already missed one exam, and need to miss a second due to a medical or family emergency, please see me individually.

Required Materials

1. Lecture Tutorials for Introductory Astronomy, 3rd Edition. (by Prather, Slater, Adams, Brissenden, & the CAPER team) - Workbook for in-class exercises. **MUST BE PURCHASED NEW**
2. Your online textbook (**FREE**). *Astronomy*, courtesy of OpenStax. Full URL: https://cnx.org/contents/LnN76Opl@13.87:_45u6IpQ@4/Introduction You may also download the book in electronic form, by clicking "Get This Book".
3. Your TPS answer cards. Print off a **COLOR** copy, using the document on our Moodle site.
4. Occasionally, you will need a calculator in class. A basic scientific calculator will work well.

Grading

In this course, you will be graded based on your performance on a combination of exams, homework, and your attendance. There will be 3 semester exams, plus a comprehensive final. The lowest of your three *semester* exam grades can be dropped when calculating your final grade, and may be replaced with your attendance grade (note: you can **not** drop your final exam). So you can ultimately *drop* your lowest semester exam, provided your attendance grade is better. Breakdown of the points is as follows:

Semester Exams	40%	(20% each for best 2 exam scores)
Attendance (*or* Lowest Exam Score)	20%	(Attendance for most students)
Homework:	20%	
Final Exam:	20%	

Final grades will be calculated based on a 60/70/80/90 scale:

90-100%	A
80-89.9%	B
70-79.9%	C
60-69.9%	D
0-59.9%	F

NOTE: Since I began teaching intro astronomy, ~ 95% of students have benefited from dropping their lowest exam (swapping it with attendance). So attendance will likely be a direct boost to your grade if you come to class. **I want to reward students for attending and participating.** Not only is there a mountain of research supporting the gains students make when interacting with *each other* (not just the instructor), but there is a strong correlation between student attendance and grades.

Homework

Homework will be done online. This semester, we are using a FREE online homework service, called SmartWork5. **You must access it by clicking on the Tool/Link on our class Moodle Page** (*do NOT go directly to their website to log on, as it won't relay your info back to Moodle properly*). You will have one homework set assigned each week of the class (with the exception of semester exam weeks). Homework will always be due at the end of that week, on Sunday evening at 10 PM.

Setting Up Homework Access – You will need to click on the Tool on our Moodle Page, under "Introduction and Course Resources." Click on "SmartWork Assignments." You'll be prompted to create a log-in and password. (When asked for your first / last name, please enter them in full - as they are listed on your official UM enrollment). You will be given 3 options for access, and **make sure you choose "Free Trial Access."** The website may state you've only got a limited number of weeks for access (ignore this). I've confirmed with Norton directly that you each get **free access** for 6 months.

It is important you engage in the material outside regular class. For most questions you answer, you will receive multiple chances to answer, with only a small penalty for wrong answers. Homework is another tool to not just further your understanding, but supplement/boost your course grade.

Tips for Success

1. *Attend Class.* Attendance to class is the most important route to understanding course content and what you will need to know to succeed in the course. Not only this, but attendance will be taken routinely, which will account for a sizeable portion of your grade.

2. *Work Together With Your Peers.* The lecture portion of the class will regularly include Lecture-Tutorials you will engage in with a small group of classmates. These are thoroughly researched activities that have been shown to help students address common misconceptions that arise in introductory astronomy. Research has consistently shown that, when students are actively engaged in class and interact with their peers, learning occurs at a much deeper level. So please work, discuss, and learn together.

3. *Read the text, and do all your homework*. The suggested readings provide additional or alternative explanations that might make more sense to you than some of mine. I will only assign readings and homework problems I consider essential.

4. See me if you are having difficulty. I am here to help, and want to see you succeed. If you are having trouble with any aspect of the course, please visit with me!

Special Accommodations

If you have a physical, learning, or psychological disability and require accommodations, please let me know as soon as possible. I am happy to discuss this with you, and want to do what I can to help. You will need to register with, and provide documentation of your disability to Disability Services for Students (DSS). Visit them in Lommasson 154, or reach them at (406) 243-2243.

Academic Honesty

I will be adhering to the university's policy on academic honesty and integrity. I will encourage you to work with your classmates as much as possible during class activities, and outside of class. However, when taking quizzes, exams, or working on assignment, do your own work. Any indication of sharing or getting your work from others will result in a zero for that quiz, exam, or assignment, and could also result in formal proceedings for academic misconduct.

Instructor's Note

In a lecture class of this size, it will be difficult for me to get to know each student by name (but I will try like crazy). I very much enjoy getting to know students as individuals, and will make every attempt to do so during the lecture. Please do not hesitate to visit me during an office hour with any concerns you have about the class content or the course in general.

Astronomy has been a thriving passion and inspirational force in my life for many years. I cannot adequately describe the wonder and awe I feel when viewing the night sky and pondering its vast expanse. It is my hope to increase your appreciation for this amazing place we call the universe. I couldn't be more excited to teach this course, and I am thrilled at the chance to work with you all this semester.

COURSE SCHEDULE

Date	Topic	Lecture-Tutorial	Text
	Week 1: Introduction, The Night Sky		
01/23	Introduction, Syllabus, Numbers, Contact	SS (113-115)	1.1–1.7
01/25	The Celestial Sphere, Motion	P (1-2), **HW:** M (3-6)	2.1
	Week 2: Seasonal Shifts		
01/30	Seasonal Stars, Path of Sun	SS (7-9) **HW:** PoTS (89-92)	2.1
02/01	Path of Sun & The Seasons	PoTS (89-92), S (93-98)	2.1
	Week 3: Kepler's & Newton's Laws		
02/06	Kepler's Laws	K2L (21 - 24), K3L (25 - 28)	3.1
02/08	Newton's Laws of Motion, Gravitation	NL&G (29 - 32)	3.2-3.3; 3.5
	Week 4: Fundamentals of Light		
02/13	Light & Telescopes	EMSL (47-49), TaEA (51-53)	5.1–5.2; 6.1–6.2
02/15	Production of Light, Kirchoff's Laws	L&A (65-69), ToS (63-64)	5.3–5.5
	Week 5: Exam 1		
02/20	Review, Exam 1		
02/22	Distance – Parallax and the Parsec	P (37-39), PD (41-43)	19.1-19.2
	Week 6: Stellar Properties		
02/27	Brightness vs. Luminosity (m vs. M)	AaAMS (33-35)	17.1
03/01	Stellar Motion & The Doppler Shift	DS (75-80)	5.6
	Week 7: STARS!!!		
03/06	Temperature, Blackbody Radiation	BR (59–62)	17.2
03/08	Classification of Stars, Stellar Pop.	H-RD (117-118), SP (45-46)	17.3-17.4; 18
	Week 8: STARS – Digging Deeper		
03/13	What Spectra Can Tell Us	AS (71-74)	18
03/15	Binary Stars, Exoplanets	BS or MoEP (125-131)	18.2; 21.3-21.6
	Week 9: Exam 2		
03/20	Review Session, Exam 2		
03/22	Stars and Energy Production	Stars & Equilibrium (**MR)**	15.1
SPRING BREAK!			
	Week 10: Stellar Lifecycles (Part I)		
04/03	Star Birth and Life	SF&L (119-120)	21.1-21.2
04/05	Stellar Evolution and Death, **VIDEO**	SE (133-134)	22

Week 11: Stellar Lifecycles (Part II)

04/10	Stellar Corpses, Binary Interactions	Relativity/other **(MR)**	23.1-23.5
04/12	Star Clusters, MS Fitting	Star Clusters **(MR)**	22.2-22.3

Week 12: The Milky Way, Galaxies

04/17	The Milky Way, Dark Matter	DM (143-147)	25
04/19	Galaxies	GC (139-142)	26

Week 13: Cosmology

04/24	Hubble's Law, Expansion of Univ.	HL (155-160)	28.1, 29.1
04/26	The Big Bang, **VIDEO**	MSUE (151-154), BB (165-168)	29.2-29.4

Week 14: Exam 3

05/01	Review Session, Exam 3	
05/03	**BONUS MATERIAL - Student Topic**	Write exam question in groups.

Week 15: Final Exam