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Fall 9-1-2021

### ASTR 131N.01: Planetary Astronomy

Mark Andrew Reiser

*University of Montana, Missoula*, [mark.reiser@umontana.edu](mailto:mark.reiser@umontana.edu)

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<b>Instructor:</b> Mark Reiser	<b>Class Time:</b> Tues/Thur, 9:30 AM – 11:00 PM
<b>Room:</b> Urey 101	<b>Zoom:</b> <a href="https://umontana.zoom.us/j/935917675">https://umontana.zoom.us/j/935917675</a>
<b>My Office:</b> CHCB 120	<b>E-mail:</b> <a href="mailto:mark.reiser@umontana.edu">mark.reiser@umontana.edu</a>
<b>Office Hours (3):</b> <b>Tues:</b> 11-12 <b>Wed:</b> 10-11 <b>Thur:</b> 2-3	<b>(or appointment)</b>

**Course Description**

This course provides an introduction to some of the most fundamental and exciting concepts in astronomy, with a particular emphasis on planetary astronomy, and our solar system as a whole. We will cover topics such as mechanics of the night sky, comparative planetology, solar weather, and space travel.

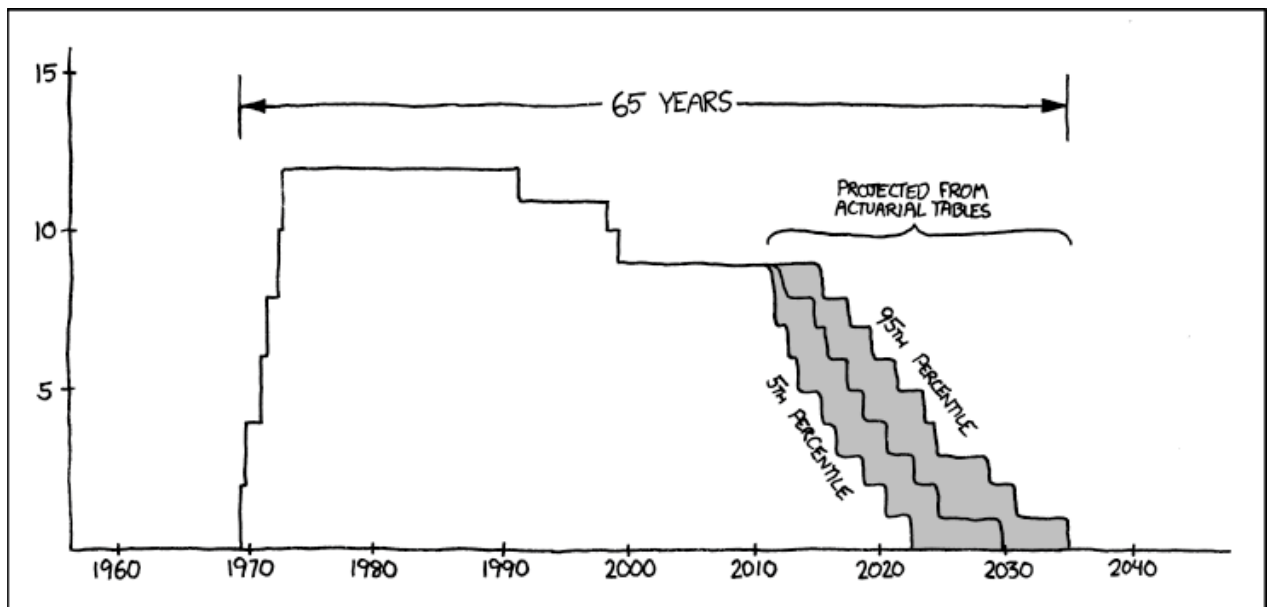
In this course, we'll emphasize that astronomy is not simply a collection of facts, theories, and discoveries. Rather, astronomy is a *process*. Science, in general, is a method for asking questions about the universe. It is a systematic process whereby we seek a better and better understanding of how the universe behaves.

**Delivery**

This class is designated as *live, and in-person*, in Urey Lecture Hall (ULH 101). I am so pleased that we will be together! While I **strongly encourage** you to get vaccinated if you haven't, the current status of the COVID pandemic requires us all to **wear masks in class at all times**. That could hopefully change as the semester continues, and I will update you as I can.

**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.



NUMBER OF LIVING HUMANS WHO HAVE WALKED ON ANOTHER WORLD

Credit: XKCD

### Attendance

Class attendance is strongly encouraged, and **extra credit**. Each day of lecture (except exams), attendance will be **self-recorded**. You can record your own attendance in/after class using Moodle, and I'll apply this as EC at the end of the semester. Each class, you can record a "P" (present for entire class), an "L" (late arrival, or leaving early), or an "A" (absent). Moodle will automatically record your attendance as "Absent" if you don't enter it before midnight (11:55 PM) the evening of a lecture.

**NOTE:** Substantial research supports the gains students make when interacting with *each other*, and not just the instructor. Thus, I want to directly reward students for attending and participating!

### Required Materials

1. Lecture Tutorials for Introductory Astronomy, 3<sup>rd</sup> Edition. (by Prather, Slater, Adams, Brissenden, & the CAPER team) - Workbook for in-class exercises. **MUST BE PURCHASED NEW**
2. Think-Pair-Share answer cards. **Print a COLOR copy, using a PDF on Moodle.**
3. Occasionally: you may need a calculator. A basic scientific calculator (or smartphone) will work.
4. Optional: online textbook (**FREE**). *Astronomy*, courtesy of OpenStax. Full URL: <https://cnx.org/contents/LnN76Opl@14.33:t5W09zMY@12/Preface> You can download the full book in electronic form, by clicking "Get This Book".

### Grading

You'll be graded based on a combination of **online exams** and **homework**. There are 3 semester exams, plus a comprehensive final. The lowest of these 3 semester exams will be automatically dropped when calculating your final grade. Breakdown of total points:

Semester Exams (best 2 scores)	50%	(25% each, keep best 2 of 3 exams)
Final Exam	25%	
Homework	<u>25%</u>	
<b>Total</b>	<b>100%</b>	
<i>Attendance (Extra credit)</i>	0-5%	

Final grades will follow 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

### Homework

Homework will be done *online*. We are using SmartWork5, and 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 to Moodle*). You'll have a homework set assigned each week of the semester - with the exception of semester exam weeks. Homework will be due on Monday nights at midnight, and exams on Fridays.

Setting Up Homework Access – Please see the Word document on our Moodle page: **How to Register for SmartWork5**.

It is important you engage in the material outside of class. For all HW questions, you will have multiple attempts, with a small penalty of 3 – 5% per question on any wrong answer (i.e., you could answer every question wrong once, and still earn a grade of 95% on a given homework assignment!). 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 need to know to succeed. Further, you can directly use attendance as **extra credit!**

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. Most of these strategic 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 **before lecture**, and do your homework.* The suggested readings provide additional or alternate explanations that might prove helpful, especially before I lecture on that material. I only assign readings and homework problems I consider essential.

4. *See me if you're having difficulty.* I'm here to help, and want you to succeed. If you're having trouble with the course, please visit with me! My office hours are for **you**. Office hours = student hours.

### **Accessibility Statement**

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and the Office for Disability Equity (ODE). If you anticipate or experience barriers based on disability, please contact the ODE at: (406) 243-2243, [ode@umontana.edu](mailto:ode@umontana.edu), or visit [www.umt.edu/disability](http://www.umt.edu/disability) for more information. Retroactive accommodation requests will not be honored, so please, do not delay. As your instructor, I will work with you and the ODE to implement an effective accommodation, and you are welcome to contact me privately if you wish.

### **Academic Honesty**

I will be adhering to the university's policy on academic honesty and integrity. I encourage you to work with your classmates as much as possible during class activities and outside 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 exam or assignment, and could also result in formal proceedings for academic misconduct.

### **Instructor's Note**

In a class of this size, it's difficult for me to get to know each student's name (but I will try my best). I very much enjoy getting to know students as individuals, and will make every attempt to do so during lecture. Please do not hesitate to visit me during an office hour with concerns about class content or the course in general. My office hours are for **YOU!** Office hours = student hours.

Finally, astronomy has been a driving passion and inspirational force in my life for over 20 years. I cannot adequately describe the wonder and awe I feel when viewing the night sky, and pondering the entire cosmos. It is my hope to increase your appreciation for what lies above. I absolutely love teaching astronomy, and I am thrilled at the chance to work with you this semester!

## COURSE SCHEDULE

Date	Topic	Lecture-Tutorial	Online Text
<i>Week 1: Introduction – Celestial Sphere</i>			
08/31	Introduction, Celestial Sphere, Preview	P (1-2)	1.1 - 1.7
09/02	Daily Celestial Motion	M (3-6)	2.1
<i>Week 2: Celestial Mechanics</i>			
09/07	Seasonal Stars, Sidereal vs. Solar Days	SS (7-9) Optional: SvSD (11-12)	2.1, 4.3
09/09	Earth's Axial Tilt, Seasons	S (93-98) Optional: 89-92	4.2
<i>Week 3: Cyclical Movements and Orbits</i>			
09/14	The Lunar Cycle	PMP (85-87) Optional: 81-83	4.5, 4.7
09/16	Kepler's Laws, the Analemma	K2L (21-24)	3.1
<i>Week 4: Newton, and the Birth of Solar System</i>			
09/21	Gravity, Observing satellites, meteors	NL&G (29 - 32)	3.2 - 3.5, 4.6
09/23	Formation of Solar System, <b>Exam 1</b>	TAFOS (111-112)	7.1-7.4, 14.3
<i>Week 5: Earth-Moon System</i>			
09/28	Earth-Moon System, Tidal Forces	Lunar Tides (Mark)	4.6, 9.1 - 9.4
09/30	Earth-Moon (Part 2)	ECS (101-103)	8.1-8.5
<i>Week 6: Terrestrial Planets</i>			
10/05	Terrestrials Part 1 – Mars	GE (105-110)	10.1, 10.4-10.5
10/07	Terrestrials Part 2 – Venus, Mercury	Ter. Plan. (Mark)	10.2-10.3, 9.5
<i>Week 7: Giant Planets</i>			
10/12	Gas Giants: Jupiter & Saturn	TBD	11.1-11.3
10/14	Ice Giants: Uranus & Neptune	CGA: 11C and 11E	11.1-11.3
<i>Week 8: Observing the Planets</i>			
10/19	Planetary Observing, Pro v. Retrograde	ORM (99-100)	2.2-2.4
10/21	Jovian Satellites, <b>Exam 2</b>	CGA: 12D	12.2
<i>Week 9: More Moons, Debris</i>			
10/26	Other Moons	CGA: 12A	12.3
10/28	Rocks: Asteroids, Dust	CGA: 13G	13.1, 14.1-14.2
<i>Week 10: More Debris</i>			
11/02	Snowballs: Comets, KBO's	CGA: 12J	12.4, 13.3-13.4
11/04	Pluto, Planet Discussion	Planet Discussion (cont)	15.1-15.3

*Week 11: Our Stellar Neighbor*

11/09	The sun, Aurora	SS (113-115)	15.4
11/11	Veterans Day: <b>NO CLASS</b>		

*Week 12: Exoplanets*

11/16	Exoplanet Detection: RV Method	CGA: 21C	21.3-21.4
11/18	Exoplanets: Transit, Direct, <b>Exam 3</b>	MEP (125-127)	

*Week 13: Exoplanets (cont.)*

11/23	Exoplanets: Census, Habitable Zone	CGA: 21A	
11/25	Thanksgiving: <b>NO CLASS</b>	(or...eat stuffing and cranberry sauce together?)	

*Week 14: Space Exploration*

11/30	Classic Missions - Pioneer, Voyager, etc.	Voyager Activity	
12/02	Cassini, New Horizons, Juno, ISS, etc...	Write Final Exam Question(s)	

*Week 15: Put a Bow on It*

12/07	Planetarium Visit	Sign up 30-min visit (optional)	
12/09	Evals, Review/Game/Activity		

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*Week 16: Final Exam – Tuesday, December 14<sup>th</sup>, 10:10 AM – 12:10 PM*

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## Homework Schedule: SmartWork5

<u>Assignment</u>	<u>Due Date (Last submission 11:59 PM)</u>
Week 1	<b>09/13</b> Monday (Note: you have an extra week for assignment #1)
Week 2	<b>09/13</b> Monday
Week 3	09/20 Monday
<b>Week 4 (Exam 1)</b>	<b>09/24 Friday</b>
Week 5	10/04 Monday
Week 6	10/11 Monday
Week 7	10/18 Monday
<b>Week 8 (Exam 2)</b>	<b>10/22 Friday</b>
Week 9	11/01 Monday
Week 10	11/08 Monday
Week 11	11/15 Monday
<b>Week 12 (Exam 3)</b>	<b>11/19 Friday</b>
Week 13	11/29 Monday
Week 14	12/06 Monday

**\*NOTE:** Homework can be accepted past the due date, but there is a 5% penalty per day for late work.