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University of Montana Course Syllabi, 2021-2025

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Spring 2-1-2022

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

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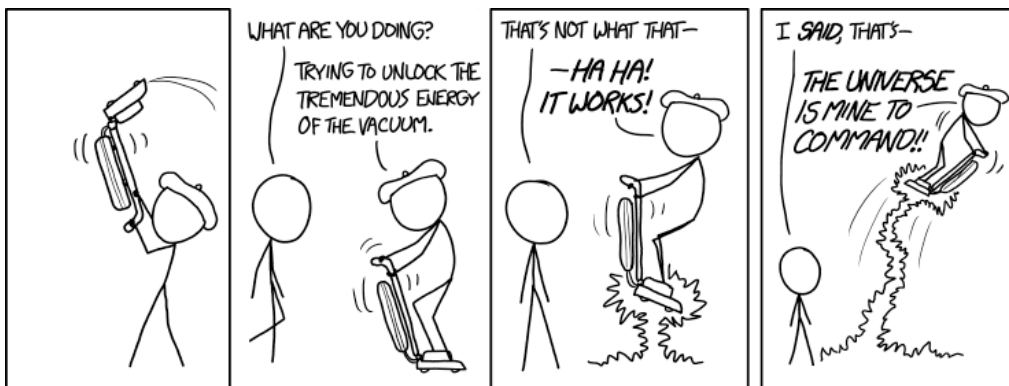
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**Instructor:** Mark Reiser      **Class Times:** Tues, Thur 9:30 – 10:50 AM  
**Room:** Urey Lecture Hall 101      **Format:** in-person  
**My Office:** CHCB 120      **E-mail:** [mark.reiser@umontana.edu](mailto:mark.reiser@umontana.edu)  
**Office Hours (3):** Tue 11-12      **Wed 10-11**      **Fri 11-12**      (or appointment)  
**Learning Assistant:** Alex West, [alexander.west@umconnect.umt.edu](mailto:alexander.west@umconnect.umt.edu)



Credit: XKCD

**Course Description**

This course provides an introduction to some of the most fundamental and exciting concepts in astronomy, with a particular emphasis on extrasolar phenomena (ie., outside our solar system). We’ll cover topics such as the production and propagation of light, the life cycles of stars, the distribution of galaxies, and the history and fate of the universe as a whole.

As the semester unfolds, I want to emphasize astronomy is not simply a collection of facts, theories, and scientific discoveries. Astronomy is a *process*. Science, in general, is a method for asking questions about the universe. It is a systematic process whereby we seek to constantly improve our understanding of how the universe behaves.

**Delivery**

This class is designated as live and **in-person**, in Urey Lecture Hall (ULH 101). 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**. Please note there is **not** a Zoom component to this course, but I will record audio of lecture for those who need to quarantine for COVID-related issues only.

**Objectives**

- appreciate the scientific process and how it works
- 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**

Substantial research supports the gains students make when interacting with *each other*, and not just the instructor. Thus, I like to reward students for attending and participating! Class attendance is strongly

encouraged, and **extra credit**. Each day of lecture, attendance will be **self-recorded**. You can record your attendance during/after class using Moodle, and I'll apply your attendance grade as EC at the end of term, where you can earn back up to **5% on your course grade** (i.e., half a letter grade). Each class, you can record **P** (present for entire class, participated fully w/ peers), **L** (late arrival, or left early), or **A** (absent). Moodle will auto record **Absent** if you don't enter it before midnight (11:55 PM) the evening of class.

**NOTES:** If you attend at least 75% of class sessions, **I'll drop your lowest Semester Exam score** in the calculation of your final grade. If you need to miss class for *COVID-related quarantining*, **please email me ahead of time**, and I will record audio of that day's class I can pass to you later.

**Required Materials**

1. Lecture Tutorials for Introductory Astronomy, 3<sup>rd</sup> Edition, by Prather, Slater, Adams, Brissenden, & CAPER team (ISBN 9780321820464). Workbook for in-class exercises. **MUST BE PURCHASED NEW** - same book we used in ASTR 131N
2. Your online textbook (**FREE**). *Astronomy*, courtesy of OpenStax. Full URL: <https://cnx.org/contents/LnN76Opl@14.33:t5W09zMY@12/Preface> You can also download the full book in electronic form, by clicking "Get This Book".
3. Occasionally, you'll need a calculator in class. A basic scientific calculator will work well.

**Grading**

You'll be graded based on a combination of homework and online exams. There are 3 semester exams, plus a comprehensive final. **If you attend 75% or more lecture periods, I'll drop the lowest of your 3 Semester Exams**, keeping only the best 2 when calculating your final grade. Breakdown of total points:

Homework	<b>25%</b>	
Semester Exams (x3)	<b>50%</b>	(3 exams, <b>or</b> best 2)
Final Exam	<b>25%</b>	
<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*. This semester, we are using SmartWork5. Each time, **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 properly). You'll have one homework set assigned each week of the semester - except on exam weeks. Homework is typically due **Mondays at midnight**. It's important you engage in the material outside class. Homework is another tool to further your understanding, and can also help boost your course grade.

Setting Up Homework – Please see the last page of the syllabus: **How to Register for SmartWork5**.

Homework Grading – For all HW questions, you will have multiple attempts to arrive at the correct answer. For an incorrect response, I've set up SmartWork to deduct 5% of the points possible for that question. (i.e., **not** 5% on the entire homework). If you answer a question correctly on your 1<sup>st</sup> attempt, you'll earn 100% of that problem's point value. If it's on your 2<sup>nd</sup> attempt, you'll get 95%. If correct on 3<sup>rd</sup> attempt,

you'll get 90% of the points for that question, and so on. For example, if you answer *every question wrong one time*, but then answer it correctly on your second attempt, the lowest grade you could receive on the entire HW set is still 95%. If you complete your homework on time, even if it takes you an attempt or more per question, you should still be in the 90's. This is very generous! Just make sure to successfully complete all questions, because any question left unanswered is awarded 0% of points allotted to it.

### **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. 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 **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 = open student hours**

### **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 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 exam or assignment, and could also result in formal proceedings for academic misconduct.

### **Instructor's Note**

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

Astronomy has been a driving 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 the entire cosmos. It is my hope to increase your appreciation for this amazing place we call the universe. I absolutely love teaching this course, and I am thrilled at the chance to work with you this semester!

## COURSE SCHEDULE

Date	Topic	Lecture-Tutorial	Online Text Reading <a href="#">Book Link</a>
<b>Week 1: Introduction</b>			
01/18	Intro, <b>Register Smartwork5; print TPS</b>		Moodle PPT
01/20	General Intro, Numbers, Setting Stage	SS (113-115)	1.1-1.7
<b>Week 2: A Little Physics</b>			
01/25	Kepler's Laws	K3L (25 - 28)	3.1
01/27	Newton's Laws of Motion, Gravitation	NL&G (29 - 32)	3.2-3.3; 3.5
<b>Week 3: Let There Be Electromagnetic Waves</b>			
02/01	Light & Telescopes	TaEA (51-53)	5.1-5.2; 6.1-6.2
02/03	Production of Light, Kirchoff's Laws	L&A (65-69), *ToS (63-64)	5.3-5.5
<b>Week 4: Measuring Stellar Properties</b>			
02/08	Distance – Parallax and the Parsec	PD (41-43)	19.1-19.2
02/10	Brightness vs. Luminosity (m vs. M)	AaAMS (33-35)	17.1
<b>Week 5: Exam 1</b>			
02/15	Review/Misc, <b>Exam 1</b>		
02/17	Stellar Motion & The Doppler Shift	DS (75-80)	5.6
<b>Week 6: Stars!!!</b>			
02/22	Stellar Temperature, Blackbody Radiation	BR (59-62)	17.2
02/24	Classification of Stars, Analyzing Spectra	AS (71-74)	17.3-17.4
<b>Week 7: Stars!!! (continued)</b>			
03/01	A Stellar Census, The H-R Diagram	H-RD (117-118)	18.1, 18.3-18.4
03/03	Binary Stars	BS (121-124)	18.2; 21.3-21.6
<b>Week 8: Energy and Stars</b>			
03/08	Stars and Energy Production	Group Activity	15.1
03/10	Star Birth and Life	SF&L (119-120)	21.1-21.2
<b>Week 9: Exam 2, Stellar Evolution</b>			
03/15	Review/Misc, <b>Exam 2</b>		
03/17	Stellar Evolution, Variable Stars	Group Activity	22
<b>Week 10: Stellar Lifecycles (Part I)</b>			
03/29	Stellar Evo & Death; EITS Movie #1	Group Activity (TBD)	22
03/31	Stellar Remnants, Binary Interactions	SE (133-134)	23.1-23.5

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<b>Week 11: Star Clusters, The Milky Way</b>			
<b>04/05</b>	Star Clusters, Main-Seq. Fitting	<b>Star Clusters (handout)</b>	22.2-22.3
<b>04/07</b>	The Milky Way, Dark Matter	<b>DM (143-147)</b>	25

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<b>Week 12: Galaxies, Universal Expansion</b>			
<b>04/12</b>	Galaxies	<b>GC (139-142)</b>	26
<b>04/14</b>	Hubble's Law, Expansion of Univ.	<b>HL (155-160)</b>	28.1, 29.1

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<b>Week 13: Exam 3, The Big Bang</b>			
<b>04/19</b>	Half Day/Misc, <b>Exam 3</b>		
<b>04/21</b>	The Big Bang, EITS Movie #2	<b>BB (165-168)</b>	29.2-29.4

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<b>Week 14: Planetarium Week!</b>			
<b>04/26</b>	Planetarium Visit, Groups 1-4		
<b>04/28</b>	Planetarium Visit, Groups 5-8		

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<b>Week 15: Black Holes, Finale</b>			
<b>05/03</b>	Black Holes	<b>Group Activity</b>	24
<b>05/05</b>	EVALS, Semester Review/Jeopardy	<b>Write exam question in groups</b>	

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**Week 16: Final Exam – Wednesday, May 11<sup>th</sup>, 8:00 – 10:00 AM**

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## Homework Schedule: SmartWork5

Assignment	Due Date (Last submission 11:59 PM)
Week 1	<b>01/31 Monday</b> (you have an extra week to complete HW 1)
Week 2	<b>01/31 Monday</b>
Week 3	<b>02/07 Monday</b>
Week 4	<b>02/14 Monday</b>
Week 5 (Exam Week)	None
Week 6	<b>02/28 Monday</b>
Week 7	<b>03/07 Monday</b>
Week 8	<b>03/14 Monday</b>
Week 9 (Exam Week)	None
Week 10	<b>04/04 Monday</b>
Week 11	<b>04/11 Monday</b>
Week 12	<b>04/18 Monday</b>
Week 13 (Exam Week)	None
Week 14 (Planetarium)	None
Week 15	<b>05/06 Friday</b>

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

### How to Register for SmartWork5 (weekly homework)

1. When logged in to **Moodle**, and from homepage of our **course website**, click on external tool near the top, "Smartwork Homework."

**IMPORTANT:** This is how you will always access your homework assignments. Do not bookmark the SmartWork website, as it's possible to access their site externally, which would allow you to bypass Moodle. However, any time you do your homework, **ALWAYS** access it by **clicking the Smartwork tool on our Moodle page**, in order to ensure your UM Moodle account is syncing properly with SmartWork.

2. Once on the Smartwork5 site, you will be given 2 options:
  - A. If you purchased SmartWork5 for use in another class within the past calendar year, you can choose the first option: "Yes, I want to sign in." You can just use your info from last term, you should be set!
  - B. If this is your first time in the last year (or first time ever) using Smartwork5, choose the second option: "No, I need to register, purchase, or sign up for trial access".

If you are purchasing new access (Option B):

3. Enter your information, then select the second option, "I want to **purchase access**".
4. From there, choose the cheapest option, which is to purchase stand-alone access for SmartWork5, for \$30.

**NOTE:** You do NOT need the textbook/e-book offered from Norton. Remember, we are using a **free** textbook from the OpenStax database. That is the only e-text you will need for this course. SmartWork5 may occasionally reference their e-text in the homework assignments, but it will never be necessary to complete a problem. Do **not** purchase it.