Astronomy 135
Stars, Galaxies, and the Universe Lab
Course Syllabus - Spring 2017

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OFFICE: CHCB 129 (inside the Physics/Astronomy dept. office)

OFFICE HOURS: M 10-11, W 10-11 and 3-4, Th 9-10 and 11-noon
Please feel free to stop by or make an appointment for other times.

Required supplies: You will need a calculator capable of doing scientific notation and a small flashlight or headlamp for the nighttime observing.

Moodle:

You have TWO Astronomy 135 course shells in Moodle:

A common area: *Stars, Galaxies, and Universe Common Area Spring 2017*
Important course announcements, all lab exercises, and very useful links and resources will be posted on Moodle in the Astronomy 135 Common Area. You will need to check the Common Area every week before lab to make sure you are up to date on the activities and resources for that week.

A section specific shell: *Stars, Galaxies, and Universe Lab Sect. xx*
QUIZZES and all of your lab grades will be posted in the Moodle shell for your specific lab section.

Labs:

All labs will be available for download in the *Stars, Galaxies, and Universe* ***Common Area***. You do not need to purchase a lab manual for this course.

IMPORTANT: You **MUST** bring a hardcopy of each week's lab to class with you. There will be a standard 10% reduction in your weekly lab grade if you come to class without the write-up.

16" telescope and dome
Skaggs Observing Deck

Astronomical Observing

Observing the universe personally is an experience not to be missed! Even on campus, a clear, dark Montana night will yield spectacular views of star clusters, nebulas, and galaxies. I would like everyone in the class to have a chance to observe.

Early this semester we will visit the Planetarium to do some stargazing and get familiar with what is currently up in the night sky. Although Spring semester weather in Missoula is notoriously cloudy, we will try to have one formal observing lab later in the semester, and hopefully, some informal observing opportunities where you can bring your friends and/or family members to our Skaggs rooftop observatory.

Course Content

This course will give you an introduction to some of the METHODS astronomers use to study the universe. You will have a chance to see deep-sky objects through a telescope, use modern computer software to explore deep-sky objects, analyze astronomical data, and discover HOW astronomers gather information about the stars, the galaxy in which we live, and the universe at large.

By the time you finish this course you should

- know how to find your way around the night sky
- know where and how to look up information on any object in the sky you are curious about
- have gained a fundamental knowledge of the properties of light and the information that can be gleaned from it
- be able to apply your understanding of light to determine properties of stars (including our Sun) and their evolution over time
- understand the role of gravity in the motion of celestial objects and the evolution of structure in the universe
- be able to apply your knowledge of gravity and orbits to deduce the mass of objects from black holes to galaxies
- know the basic characteristics of our home galaxy, the Milky Way
- understand how galaxies can differ from one another, how they evolve over time, and what they can tell us about the evolution of the universe
- have gained experience with some of the *techniques* that have enabled us to discover some amazing things about the universe we live in!

Specific, detailed learning objectives for each laboratory exercise are given at the beginning of each lab write-up.

Course Expectations

The labs will often expand on material presented in Astronomy 132, so it is important that you attend the lectures and keep up with any readings or activities in that class before coming to lab. Most past students of the lab have found that the more in-depth, practical experience of the laboratory course greatly helps their understanding of some of the material presented in the lecture.

Throughout the course you will be expected to:

1. Read through the experiments (at least the introductory material in them) and complete any pre-lab reading required before coming to class. Make sure you understand the material from the lecture that relates to the lab.
2. Ask questions. Come prepared to enter into discussion. Try to ask questions that help you focus on the big picture, not just procedural details.
3. Do your own work. In short, always practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. If you have not read through the material at http://www.umt.edu/vpsa/policies/student_conduct.php, do so now!

   IMPORTANT: Specifically, in this course, academic honesty means that each student contributes equally to the completion and write-up of each lab. EVERY student working in a group is expected to be a thinking, questioning, contributing member! Lab quizzes are to be worked on **alone**.

   I reserve the right to assign zero credit to students I suspect of relying on the work of others. The zero score may be replaced with a full credit grade by scheduling an oral interview that will cover the concepts of that particular lab. If you can convince me that you understand the material, I will grade you on the work you submitted.

Grading

This course consists of 13 graded labs. Your grade for each lab (with the exception of the first two labs and the observing lab) will consist of two parts. 50% of your grade will be based on the satisfactory completion of your weekly lab in class. I will look through these at the end of your lab period, checking to see if they are complete and spot-checking some of the more difficult questions. We can go over any problems you had questions on. You

should also feel free to come see me outside of class if you have additional questions you would like to clear up before taking the quiz. You **must** get your lab checked off before leaving class each week. The remaining 50% of your grade will be based on a weekly Moodle quiz that will test your understanding of the material presented in the lab. Each quiz will be open from the end of your lab until 1 p.m. on Wednesday the following week. Answers to quiz questions will be available once the quiz has closed. The first two labs (Scaling the Universe and Exploring the Night Sky) and the evening Observing Lab will be graded solely on your work done in lab. (NO quiz for these labs.)

Grading summary

In class lab write-up: 50% of weekly grade
Before leaving lab you must submit your completed lab write-up for review and grading. I will use the following scale:

√+	100%	Everything complete and virtually everything correct
√	80%	Everything complete and mostly correct
√-	60%	Incomplete, hurried work and/or many major misconceptions
	< 60%	Much of lab not seriously attempted

Lab quiz: 50% of weekly grade

- To be completed on your own.
- Covers concepts from that week's lab.
- Can be completed anytime between the end of your lab and the following Wednesday at 1 pm.

Exceptions:
Scaling the Universe, Planetarium, and night Observing Labs: 100% of your grade for these labs will be based on work done during lab- no quiz for these three labs.

Course Grade:
At the end of the semester, I will drop your lowest lab PLUS lowest quiz grade, OR the Scaling the Universe lab, OR the Planetarium Lab, OR the night Observing Lab - whichever helps improve your grade the most. If you complete everything, you can drop your lowest of the above. Plan on grades being assigned based on the traditional grading scale: 90-100% A, 80-89% B, 70-79% C, etc. Since grades will be regularly posted on Moodle, you can easily track your progress throughout the semester.

Note on missed labs:
Because everyone can drop one week's work, there will be **NO** make-up labs. If you know ahead of time that you will have to miss a lab for a legitimate reason, please get in touch. I may be able to fit you into another lab section that week. If you have a prolonged illness or emergency with appropriate documentation, definitely come see me and I will do my best to help you out. In the case of such extenuating circumstances, all work must be turned in for grading no later than Wednesday, May 3 by 5 pm.

EQUAL ACCESS: A fair and inclusive learning environment benefits us all. I encourage students from different cultural backgrounds, students for whom English is not their native language, and/or any student who has a disability that may adversely affect their academic performance to contact me within the first few days of class to discuss appropriate accommodations. If you think you may have a disability and have not registered with DSS, please contact them in Lommasson 154, call (406) 243-2243, or view the DSS website at www.umt.edu/dss. The folks at DSS are very helpful!

ADD/DROPS: The last day to add/drop on Cyber Bear is Friday, Feb. 10. The last day to drop with your instructor's and advisor's signature, is Monday, April 3. A drop, or change of grading option after April 3 requires the signature of the Dean and written documentation of exceptional circumstances. Doing poorly in the class does not constitute adequate reason to drop the class at the end of the semester! Friday, May 5 is the last possible day to make any Spring registration changes.

Observing Notes

Moon phases this semester

New moon: Jan. 27, Feb. 26, Mar. 27, April 26, May 25
Full moon: Jan. 12, Feb. 10, Mar. 12, April 11, May 10

Meteor showers

Lyrids: night of April 22/23
Eta Aquarids: night of May 6
Perseids: night of August 12

TOTAL SOLAR ECLIPSE (through parts of Idaho- Tetons, etc.) on August 21. Not to be missed!

SPRING LAB SCHEDULE

WEEK	DATES	EXPERIMENT	LOCATION
1 **no quiz**	Jan 25, 26	**Course introduction; Scaling the Universe**	CHCB 13
2 **no quiz**	Feb 1, 2	**Exploring the Night Sky in the UM Planetarium** You may want to download a night sky app on your smartphone or laptop and bring to class with you. A number of great observing resources are listed under Week 1 in the Astr. 135 common area.	PFNAC 13 (in the basement)
3	Feb 8, 9	**Gravity and Orbits**	CHCB 13
4	Feb 15, 16	**Atomic Spectra**	CHCB 13
5 or 6 **no quiz**	Feb 21, 22 Backup dates Feb. 27, 28 Mar. 1, 2	**Night Sky Observing 7:30-9:00 & 9:00-10:30** You must sign up for an observing time on Moodle (Common Area). If your section is cancelled due to weather, sign-up again as soon as possible for one of the back-up dates. For all nighttime observing labs, call 243-4299 one hour before the start of your observing session for an update on sky conditions and whether or not the lab will be held. Do not call more than one hour before the start of your lab as weather can change rapidly and we will not necessarily make a decision prior to that.	Skaggs Roof meet outside east entrance to Skaggs Sign-ups will be posted on Moodle
5	Feb 22, 23	**No in-class lab this week.** **Don't forget to complete the Week 4 Quiz!**	
6	Mar 1, 2	**The Sun**	CHCB 13
7	Mar 8, 9	**Determining Ages of Star Clusters Using Cluster Color Magnitude Diagrams**	CHCB 13
8	Mar 15, 16	**Determining the Mass of the Black Hole at the Center of the Milky Way**	CHCB 13
9	Mar 20-24	**SPRING BREAK**	
10	Mar 29, 30	**The Milky Way**	CHCB 13
11	Apr 5, 6	**Galaxies**	CHCB 13
12	Apr 12, 13	**Dark Matter**	CHCB 13
13	Apr 19, 20	**Hubble Law: Part I**	CHCB 13
14	Apr 26, 27	**Hubble Law: Part II**	CHCB 13
15	May 3, 4	**No in-class lab this week. Final Quiz due!**	
16	May 8-12	**Finals week** NO final! Final course grades will be posted on Moodle.	