

Instructor Dr. Katrina Black Office: Fisher 121
keblack@mtu.edu Office Hours: By appt.

To make an appointment to meet outside office hours, just send me an email to arrange a time.

Textbook

Our textbook is Discovering the Essential Universe, 5th Ed., Comins. The ISBN is 978-1429255196.

Course Overview and Learning Goal

In PH1600, we will explore fundamentals of observational astronomy and astrophysics, including Kepler's and Newton's laws of motion; origin and evolution of the solar system; stellar, galactic and extra-galactic astronomy; cosmology; and modern instrumentation, including space-based astronomy.

At the end of the course, successful students will be able to:

- Accurately use and define astronomical vocabulary terms
- Perform calculations using common astronomical and physical equations
- Describe the motions of the earth, moon, and planets through space and how this motion affects our view of the night sky
- Describe features of solar system bodies and categorize solar system and exoplanet bodies based on those features
- Identify the rungs of the distance ladder and explain how each is used to measure astronomical distances
- Identify features of stars, explain the interdependence of those features, and categorize stars based on their features
- Describe the life and death of stars, and how this varies depending on stellar mass
- Describe current evidence for the expanding universe and the existence of dark matter and energy
- Use astronomical software to plan a naked eye, binocular, or telescopic observing session
- During a naked eye, binocular, or telescopic observing session, identify stars, planets, constellations, or other astronomical objects and explain to others how to locate them in the sky

PH1600 supports University Student Learning Goal 2: Knowledge of the Physical and Natural World. More information can be found at <http://www.mtu.edu/assessment/program/university-learning-goals/goal-2-rubric.pdf>

Grading Policy

Your final grade will be determined using the following weights:

Fact Check Quizzes	10%	Observing Projects	10%
Reflect Questions	10%	Midterm Exam	20%
Extend Quizzes	10%	Final Exam	20%
Weekly Homework	20%		

Letter grades will be assigned as follows:

A	100-90%	B	80-84%	C	70-74%	D	60-64%
AB	85-89%	BC	75-79%	CD	65-69%	F	0-59%

I reserve the right to adjust these cutoffs downward, but will not adjust them upward.

Class Routine

Since this class meets entirely online, you should use Canvas Modules to keep track of the order of work throughout the semester. *Especially note that Reflect questions will not appear in your to-do list!*

In general, four topics groups will due each week, Monday through Thursday at 11:59 pm Eastern time. For each group:

- Do the reading and watch the videos
- Complete the *fact check* quiz based on the reading and videos
- Post your answer to the *reflect question* on Piazza

- Work on the *extend* activities and complete the *extend questions*
- At the end of the week, complete the *weekly homework* by midnight on Friday. It behooves you to start on the homework before Friday at 11 pm! ☺

You may work ahead on the material through the midterm exam (Weeks 1 through 3); material due after the midterm will open Wednesday of Week 3.

Fact Checks: After reading and watching videos, complete the fact check, based on the videos and readings. The fact check quiz will typically be 5 questions. You will be limited to 30 minutes and one attempt for each fact check, but your lowest 3 scores will be dropped.

Reflect Questions: Since there are 26 topic groups, there are 26 reflect questions, each worth 1 point. The easiest way to earn a 100% on your reflect grade is to answer every reflect question; however, you may earn up to 40 points in the reflect section of your grade by making additional substantive (not “Me too!” or “Yeah.”) posts in the Piazza forum. Additional points beyond the required 26 will be applied as extra credit.

Extend Activities and Quizzes: For each topic, I will post additional materials to help you extend the knowledge you gained from the reading and videos. This content will vary, but will include using and understanding important astronomical equations, thinking more deeply about topics glossed over in the text and videos, etc. Each Extend activity will include a set of questions (the “Extend quiz”) to test your understanding. You will have three attempts with unlimited time for each Extend quiz until the due date. Your lowest Extend quiz will be dropped.

Homework: Each week, you will have a homework to help you synthesize the knowledge you have gained. You will have unlimited time (until the due date) but only one attempt for each homework. Your lowest homework grade will be dropped.

Projects and Exams

Observing Projects: All students will complete four observing projects of their choice over the course of the semester. These projects are designed to help you become familiar with the night sky and techniques for amateur astronomical observing. Projects are due in the last two weeks of class, but begin immediately since weather can be fickle! For details, please see the Observing projects module on Canvas.

Exams: This course has one midterm and one final exam. The midterm is scheduled for **Tuesday, June 5** and the final is scheduled for **Friday, June 29**.

Exams for this course are computerized. However, for computation questions you are encouraged to show your work on paper, which allows me to award partial credit. Your proctor can return your work to me by scanning and emailing or taking good-quality photos.

Please allow 60 minutes for your midterm exam and 120 minutes for your final exam. The final exam will be comprehensive with an emphasis on material from the second half of the semester.

For each exam, you should bring a scientific (minimum) or graphing calculator. You may also bring an 8.5 x 11 note sheet.

Exams must take place under the supervision of a proctor. Local students will use Michigan Tech's testing center. Distance students will need to arrange their own local proctors according to the guidelines posted at www.mtu.edu/ctl/for-online-learners/proctors. The proctor form should be submitted no later than Wednesday, May 23rd. Exams should take place between 7:00 AM and 9:00 PM local time on the dates listed above. Be sure that your proctor is available during these times!

Late Work and the Grace Period

I know everyone is busy, especially during a compressed summer class! Canvas will automatically apply a 12-hour grace period for every assignment. After the grace period, the assignment will lock. Please use the grace period responsibly and only when needed so that I can continue to offer it.

University Policies

This course adheres to University policies regarding academic integrity, use of student work for university, program, or course assessment, disability accommodation, institutional equity, veteran and military accommodation, and equal opportunity, discrimination, or harassment. Updated policy statements can be found at http://www.mtu.edu/ctl/instructional-resources/syllabus/syllabus_policies.html.

If you require accommodation, please don't hesitate to contact me or the Dean of Students. Off-campus students should be aware that according to University guidelines, disability accommodations are verified through the Dean of Students at <http://www.mtu.edu/deanofstudents/disability/>

Planned Topic Schedule:

Be aware that this schedule may vary slightly as the course progresses. See Canvas for updates.

Week	Day	Date	Reading	Crash Course Videos
1	1.1	14-May	1-11, Appendices A & K	1: Introduction to Astronomy
	1.2	15-May	1-1 to 1-7	2: Naked Eye Observations, 3: Cycles in the Sky
	1.3	16-May	1-8 to 1-10	4: Moon Phases, 5: Eclipses
	1.4	17-May	2-1 to 2-8	7: Gravity
	1.5	18-May	Week 1 Homework Due	
2	2.1	21-May	3-1 to 3-4; 3-12 to 3-18	24: Light
	2.2	22-May	3-5 to 3-11	6: Telescopes
	2.3	23-May	4-1 to 4-9	9: Solar System; 22: Oort Cloud
	2.4	24-May	5-1 to 5-8	11: Earth; 12: Moon, (Opt) 8: Tides
	2.5	25-May	Week 2 Homework Due	
3	3.1	28-May	Memorial Day	
	3.2	29-May	5-9 to 5-20	13: Mercury, 14: Venus, 15: Mars
	3.3	30-May	6-1 to 6-5	16: Jupiter, 17: Jupiter's Moons
	3.4	31-May	6-6 to 6-12	18: Saturn, 19: Uranus and Neptune
	3.5	1-Jun	7-1 to 7-12	20: Asteroids, 21: Comets, 23: Meteors
		Week 3 Homework Due		
4	4.1	4-Jun	Study Day	
	4.2	5-Jun	Midterm Exam	
	4.3	6-Jun	8-1 to 8-8	10: Sun
	4.4	7-Jun	9-1 to 9-7	25: Distances, 26: Stars Part 1
	4.5	8-Jun	Week 4 Homework Due	

5	5.1	11-Jun	9-8 to 9-12	26: Stars Part 2, 34: Binary Stars Part 1
	5.2	12-Jun	10-1 to 10-14	(Opt) 36: Nebulae, 35: Star Clusters, 29: Low Mass Stars, (Opt) 28: Brown Dwarfs
	5.3	13-Jun	10-15; 11-1 to 11-5	34: Binary Stars Part 2, 30: White Dwarfs, 31: High Mass Stars
	5.4	14-Jun	11-6 to 11-11	32: Neutron Stars
	5.5	15-Jun	Week 5 Homework Due	
6	6.1	18-Jun	11-12 to 11-19	33: Black Holes, 40: Gamma Ray Bursts
	6.2	19-Jun	12-1 to 12-7	37: Milky Way, 41: Dark Matter
	6.3	20-Jun	12-8 to 12-15	38: Galaxies Part 1
	6.4	21-Jun	12-16 to 12-23	38: Galaxies Part 2
	6.5	22-Jun	Week 6 Homework Due	
7	7.1	25-Jun	13-1 to 13-15	42: Big Bang and Cosmology, 43: Dark Energy, 44: History of the Universe, 45: Deep Time
	7.2	26-Jun	4-10 to 4-12; 14-1 to 14-5	27: Exoplanets, 46: Everything, the Universe,...and Life
	7.3	27-Jun	Week 7 Homework Due	
	7.4	28-Jun	Study Day	
	7.5	29-Jun	Final Exam	