PHY195 The Cosmic Universe

Gustavus Adolphus College Fall 2020

Instructor: Dr. Steven Mellema **Office:** Olin Hall 210

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Textbook: *The New Cosmic Universe*, by Steven Mellema (OpenStax 2020)

Course Policy and Evaluation:

1. **Class Meetings and Reading Assignments**: The class will meet five days a week from 11:30am-12:20pm. Class meetings will be either in person or online via Zoom meeting. Usually, four periods per week will be used for lecture, discussion or homework review. Class periods on the fifth day will be used for group problem-solving sessions or for exams. Attached is a daily calendar of all activities and reading assignments for the course. When reading assignments are made for a class session, the **reading is expected to be completed before coming to the class**.

2. "**Lectures":** The lectures for this course may seem somewhat non-traditional. They **will not** be used simply to repeat material covered in the textbook. I will assume that each student is capable of reading and understanding the textbook, which was written to be clear and complete. (Of course, questions about areas that were unclear when you read the textbook are always encouraged during class time!) Class time will be spent exploring in greater depth the concepts introduced in the textbook using demonstrations, discussion, and "Conceptests". We will also devote time to examining and developing problem-solving techniques.

3. **Pre-class, Online Reading Quizzes:** On each class day for which a reading assignment is given on the calendar, each student is required to take an online quiz to demonstrate that he/she has read and obtained a basic understanding of the material in the textbook before the next lecture.

   These quizzes will be conducted using the WebAssign program (accessible on the Internet at **webassign.net**). The day's reading quiz may be accessed at least 24 hours in advance, and **must be completed 15 minutes before class starts, i.e. at 11:15 am.**

   WebAssign will also be used to assign pre-lab activities for the corequisite lab course, PHY196. When you first register at webassign.net, you will need the access code that you have purchased as well as the class key for our class, which is:

   PHY195-001 - **gustavus 4203 3927**

4. **Use of Moodle:** The course Moodle site is the main communications platform for this class, and should be accessed several times a week. Students will be held responsible for informing themselves of all announcements/assignments made via Moodle.

5. **Homework**: Homework problems will be due approximately once per week, and written solutions are due at the beginning of class on the assigned date. (See the complete list of homework assignment due dates in the calendar below.) Late homework may be accepted at the discretion of the instructor with a reduction in credit. Homework may be submitted by scanning your hand-worked solutions into a pdf file and uploading the file into Moodle.

6. **Group Problem Solving:** Approximately once per week, students will work in assigned groups of three or four to solve difficult problems in a cooperative-learning setting. These sessions will require each group to submit a solution in a particular format, using the five-step physics problem-solving method that will be taught. The entire group will receive one grade for their solution, with the grade depending on technique (adherence to the problem-solving method) as well as the answer.

7. **Mentoring Program:** Every student in this course will be assigned a peer mentor (an upper-class Gustavus physics major). Your mentors should be contacting you once (or more if they decide) each week. Your participation in the mentoring program is required and will be counted in the final grade of this course. Thus, you are required to respond to, or contact, your mentor once each week. Mentors will be keeping track of this, so that I can give you the participation points. You can contact your mentor in any way that works for you and your mentor (in person, discord, email, text, meet, zoom, etc.). What you talk to your mentor about is up to you two (or your mentor and mentee group if you all want to chat together).

   Mentoring evaluation: You are expected to have contact with your mentor once each week beginning the week of 9/7 (Monday) and ending the week of 11/30 (post/contact by Friday 12/4). This is a total of 12 weeks (thus there should be 12 contacts with your mentor). For counting purposes, a week begins Monday morning and ends Sunday night. Participation credit to each category will be assigned as follows:
   100% for 12 total
   75% for 10 total
   50% for 8 total
   25% for 6 total
   0% for 0-5 total posts/contacts

   Additional contacts (>1/week) will not be counted nor evaluated but are welcome. Mentoring participation will count toward 5% of your overall grade this course.

8. **Attendance**: Regular attendance at all class meetings, online or in-person, is expected. Students will be held responsible for informing themselves of all announcements/assignments made in class.

9. **Exams:** There will be five one-hour exams and a two-hour final exam. The date for each of the exams is given in the calendar below. Students must arrange **in advance** to take an exam at other than the scheduled time, and may do so **only** for a valid health or school-related reason.

10. **Evaluation** :

Homework	20%
Online Reading Quizzes	10%
Group Problem Solutions	10%
Mentoring Participation	5%
Hour Exams	10% each for your best four scores
Final Exam	15%
Total	100%

Assignment of final letter grades will be based upon the following guidelines:

	B+ = 86-90%	C+ = 74-78%	D+ = 62-66%
A = 94-100%	B = 82-86%	C = 70-74%	D = 58-62%
A- = 90-94%	B- = 78-82%	C- = 66-70%	

11. **Academic Honesty**: Having signed and agreed to abide by the College's Honor Code, students thereby pledge that, in all academic exercises, examinations, papers, and reports, they shall submit their own work. In the context of this course, students are expected to collaborate and to discuss their out-of-class assignments. However, submitting under one's own name work that is merely copied from another is a violation of the Honor Code. Furthermore, seeking outside assistance during exams is expressly forbidden. A full description of the Academic Honesty Policy and the Honor Code can be found in the Academic Catalog (online at:www.gustavus.edu/general_catalog/current/acainfo).

12. **Multilingual Student Support:** Some Gusties may have grown up speaking a language (or languages) other than English at home. If so, we refer to you as "multilingual." Your multilingual background is an incredible resource for you, and for our campus, but it can come with some challenges. You can find support through the Center for International and Cultural Education's (https://gustavus.edu/cice/) Multilingual and Intercultural Program Coordinator (MIPC), Pamela Pearson (ppearson@gustavus.edu). Pamela can meet individually for tutoring in writing, consulting about specific assignments, and helping students connect with the College's support systems. If you want help with a specific task (for example, reading word problems on an exam quickly enough or revising grammar in essays), let your professor and Pamela know as soon as possible. In addition, the Writing Center (https://gustavus.edu/writingcenter/) offers tutoring from peers (some of whom are themselves multilingual) who can help you do your best writing.

13. **Requesting Accommodations**: Gustavus Adolphus College is committed to ensuring equitable and inclusive learning environments for all students. If you have a disability and anticipate or experience barriers to equal access, please speak with the accessibility resources staff about your needs. A disability may include mental health, attentional, learning, chronic health, sensory, physical, and/or short-term conditions. Students with a documented elevated risk of COVID-19 may also request academic accommodations. When appropriate, staff will guide students and professors in making accommodations to ensure equal access. Accommodations cannot be made

retroactively; therefore, to maximize your academic success at Gustavus, please contact them as early as possible. Accessibility resources staff are located in the Academic Support Center (https://gustavus.edu/asc/accessibility/) (x7227). Accessibility Resources Coordinator, Katy Clay, (clayk@gustavus.edu), can provide further information.

14. **Social Distancing:** I expect that students will comply with "social distancing" rules regarding acceptable distance (no less than six feet) from other students and the instructor, as well as with rules regarding staged entering and exiting classrooms and passing through hallways, as an expectation of the College and this class. I will provide you with guidance on my expectation of classroom entry, exit, and transitional movements on the first day of class. As your faculty instructor, I will not create activities or conditions that will require you to be within 6 feet of another, except during "pass-by" or "transitional movement" occurrences.

    Although we will be conducting small group work in this class, I expect that you will meet with your group remotely OR in a location where every group member can abide by social distancing guidelines. I will not require you to conduct this work in a confined space that does not allow for social distancing. If you choose to meet in-person with your small group, please know that any interaction with group members that is within 6 feet for 15 minutes or more (even with masks) will identify you as a contact trace for any other group members who test positive for COVID. As a faculty member, I will not create activities that require you to interact with other students in a "close contact" format.

15. **Food and Beverages in Classrooms and Laboratories:** No food will be permitted in classrooms during the fall 2020 semester unless there is a medical accommodation. Eating and drinking will be allowed when seated in public lounge spaces in academic buildings and private offices. It is **not** allowed in hallways or classrooms before, during, or after class. Eating and drinking is also not allowed while standing or walking in buildings. These restrictions are based on the risk that happens when removing a face covering to eat and drink.

16. **Copyright and Recording:** Recordings and videos of the class, produced as part of class instruction, are not to be posted or distributed in any format or on any platform without the written consent of the instructor. Posting any class recordings or materials (including excerpts and clips) to external sites or to social media will be considered a violation of this policy.

    Some class materials may be copyrighted. Access to these materials is restricted to students registered for the class using a Gustavus password. These materials may not be reproduced, shared, or distributed by students, and are made available only to those currently enrolled in this class. If a tutor needs access to these materials in order to provide you with academic support, please ask your instructor for assistance.

17. **Incompletes**: A grade of incomplete will only be given for work not completed due to circumstances beyond the control of the student.

SEPTEMBER2020

SUBJECT The Cosmic Universe PERIOD 4

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT/SUN
WEEK 1		1	2 Online classes begin; Course Outline	3 The Story Line No lab this week	4 Introduction to Physics	5/6
	Read:		Syllabus	Preface	§1.1-1.5	
WEEK 2	7 Introduction to Astronomy	8 Straight-Line Motion	9 Equations of Motion Virtual Lab: Modeling Reality	10 Circular Motion	11 Vectors Homework 1 due (in Moodle)	12/13
	Read: Chapter 2	§3.1-3.3	§3.4-3.5	Chapter 4	Chapter 5	
WEEK 3	14 Projectile Motion	15 Circular Motion Revisited	16 Introduction to Group Problems Homework 2 due (in Moodle)	17 **Hour Exam 1 (Kinematics)** Virtual Lab: 2D Kinematics	18 Solar System Overview	19/20
	Read: §6.1-6.3	§6.4-6.5			Chapter 7	
WEEK 4	21 Newton's Three Laws	22 Friction and Gravitation	23 Newton's Synthesis	24 Torque Virtual Lab: Jupiter's Moons	25 No Class (Group Problem Done Asynchronously) Homework 3 due (in Moodle)	26/27
	Read §8.1-8.5	§8.6-8.9	§8.10-8.11	Chapter 9		
WEEK 5	28 Work and Kinetic Energy	29 Potential Energy	30 Conservation of Energy			
	Read: §10.1-10.3	§10.4-10.5	§10.6-10.7			

OCTOBER2020

SUBJECT The Cosmic Universe PERIOD 4

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT/SUN
WEEK 5				1 Momentum Lab: Light, Brightness and Distance	2 Center of Mass	3/4
	Read:			§11.1-11.4	§11.5	
WEEK 6	5 Angular Momentum	6 **Nobel Conference** Group Problem	7 **Nobel Conference** Homework 4 due	8 **Hour Exam 2 (Dynamics)**	9 The Nature of Light	10/11
	Read: Chapter 12				Chapter 13	
WEEK 7	12 Spectra and the Doppler Effect	13 The Origins of Light	14 Group Problem Homework 5 due	15 Temperature Lab: Spectroscopy	16 Heat Transfer	17/18
	Read: Chapter 14	Chapter 15		§16.1-16.3	§16.4-16.6	
WEEK 8	19 **No Class: Fall Break Day**	20 Kinetic Theory	21 Nebular Theory	22 Nuclear Physics Lab: Stellar Spectra	23 Comparative Geology Homework 6 due	24/25
	Read:	Chapter 17	§18.1-18.2	§18.3-18.4	§19.1-19.2	
WEEK 9	26 Climate Change	27 Comparative Atmospheres	28 Exoplanets Lab: Greenhouse Effect	29 Exam Review Homework 7 due	30 **Hour Exam 3 (Chapters 13-20)**	31
	Read: §19.3	§19.4-19.6	Chapter 20			

NOVEMBER2020

SUBJECT The Cosmic Universe PERIOD 4

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT/SUN
						1
WEEK 10	2 The Sun Read: Chapter 21	3 Stellar Properties §22.1-22.3	4 Systematic Study of Stars §22.4-22.7	5 Celestial Distances Lab: H-R Diagram §23.1-23.3	6 Stellar Life Cycles Chapter 24	7/8
WEEK 11	9 Star Deaths Read: Chapter 25	10 The Milky Way Homework 8 due Chapter 26	11 Survey of Galaxies Chapter 27	12 Galaxy Evolution Lab: Hubble's Law Chapter 28	13 Big Bang Cosmology Chapter 29	14/15
WEEK 12	16 Exam Review Homework 9 due Read	17 **Hour Exam 4 (Chapters 21-29)**	18 Reflection and Refraction §30.1-30.3	19 T.I.R, Dispersion Lab: Reflection and Refraction §30.4-30.5	20 Mirrors §31.1-31.2	21/22
WEEK 13	23 Lenses Read: §31.3-31.5	24 Telescopes Homework 10 due 5:00 pm §31.6-31.7	25 **No Class: Thanksgiving Recess**	26 **No Class: Thanksgiving Recess**	27 **No Class: Thanksgiving Recess**	28/29
WEEK 14	30 **Online Classes Resume:** Interference Read: §32.1-32.3					

DECEMBER2020

SUBJECT The Cosmic Universe PERIOD 4

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT/SUN
WEEK 14		1 Thin Films	2 Diffraction Virtual Lab: Interference and Diffraction	3 Light as a Wave: Polarization	4 Astronomical Instruments Homework 11 due	5/6
	Read:	§32.4-32.5	§33.1-33.5	§33.6	Chapter 34	
WEEK 15	7 **Hour Exam 5 (Chapters 30-33)**	8 Group Project Presentations	9 Group Project Presentations	10 **No Class: Reading Day**	11 **Final Exam: 10:30 AM – 12:30 PM**	12/13
	Read					
	14	15	16	17	18	19/20
	21	22	23	24	25	26/27
	28	29	30	31		