

PHY195 The Cosmic Universe

Gustavus Adolphus College Fall 2017

Instructor: Dr. Steven Mellema

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Textbooks: *Physics for Scientists and Engineers* (9th Edition), by Serway and Jewett
The Cosmic Perspective (7th Edition) by Bennett, Donahue, Schneider and Voigt
Laboratory Manual (for PHY196, co-requisite lab course)

Course Policy and Evaluation:

1. **Class Meetings and Reading Assignments:** The class will meet five days a week from 11:30am-12:20pm. Usually, four periods per week will be used for lecture, recitation 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 textbooks. I will assume that each student is capable of reading and understanding those textbooks, which have been chosen for their clarity and completeness of presentation. (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 through additional worked examples.
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 textbooks for the next lecture.

These quizzes will be conducted using the WebAssign program (accessible on the World Wide Web 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 multi-term access code that came bundled with your Serway textbook as well as class keys for each relevant section, as follows:

PHY195-001 - gustavus 0605 9592 (for everyone, the main course)

PHY196-001 - gustavus 3446 9367 (for those in the Wednesday 1:30-3:20 lab section)

PHY196-002 - gustavus 8905 7880 (for those in the Thursday 2:30-4:20 lab section)

Each student should self-enroll for PHY195-001 and for the one lab section in which they are registered.

4. **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.
5. **Programming:** Each homework assignment will include one computer problem, to be completed using the Python programming language.
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. **Attendance:** Regular attendance at all class meetings is expected. Students will be held responsible for informing themselves of all announcements/assignments made in class.
8. **Use of Electronic Devices in Class:** The use of cellular phones, tablets, and laptop computers during the lectures is prohibited. Exceptions may be made to accommodate student disabilities.
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	25%
Online Reading Quizzes	10%
Group Problem Solutions	10%
Hour Exams	10% each for your <u>best</u> four scores
<u>Final Exam</u>	<u>15%</u>
Total	100%

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

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

10. **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. Footnotes, or some other acceptable form of citation must accompany any use of another's words or ideas. 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. Full descriptions 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).

11. **Help for Multilingual Students:**

Support for English learners and multilingual students is available through the Academic Support Center's English Learning Specialist (www.gustavus.edu/advising/). The ELS can meet individually with students for tutoring in writing, consulting about academic tasks, and helping students connect with the College's support systems. When requested, the ELS can consult with faculty regarding effective classroom strategies for English learners and multilingual students. The ELS can provide students with a letter to a professor that explains and supports appropriate academic arrangements (e.g., additional time on tests, additional revisions for papers). Professors make decisions based on those recommendations at their own discretion. In addition, English learners and multilingual students can seek help from peer tutors in the Writing Center (www.gustavus.edu/writingcenter/).

12. **Disability Services:**

Gustavus Adolphus College is committed to ensuring the full participation of all students in its programs. If you have a documented disability (or you think you may have a disability of any nature) and, as a result, need reasonable academic accommodation to participate in class, take tests or benefit from the College's services, then you should speak with the Disability Services staff, for a confidential discussion of your needs and appropriate plans. Course requirements cannot be waived, but reasonable accommodations may be provided based on disability documentation and course outcomes. Accommodations cannot be made retroactively; therefore, to maximize your academic success at Gustavus, please contact Disability Services as early as possible. Disability Services (www.gustavus.edu/advising/disability/) is located in the Academic Support Center.

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

SEPTEMBER 2017

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Fall 2017

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT/SUN
					1	2/3
	notes					
WEEK 1	4	5 Introduction/ Syllabus	6 Introduction to Physics Lab: Modeling Reality	7 One-Dimensional Motion	8 Equations of Motion	9/10
Reading		Bennett Chapter 1	Serway Chapter 1	Serway §2.1-2.4	Serway §2.5-2.7, 39.1	
WEEK 2	11 Circular Motion Homework Assignment #1 Due	12 Special Relativity	13 The Lorentz Transformation Lab: Kinematics in One Dimension	14 Group Problem: One-Dimensional Motion	15 Vectors Homework Assignment #2 Due	16/17
Reading	Serway §10.1-10.3	Serway §39.3-39.4 Bennett Chap. S2	Serway §39.5-39.6		Serway Chapter 3	
WEEK 3	18 Two-Dimensional Motion and Projectile Motion	19 Circular Motion	20 Group Problem: Two-Dimensional Motion Lab: Kinematics in Two Dimensions	21 The Solar System and Kepler's Laws Homework Assignment #3 Due	22 Newton's Laws	23/24
Reading	Serway §4.1-4.3	Serway §4.4-4.5		Bennett Chap. 7, §3.3	Serway §5.1-5.6	
WEEK 4	25 First Hour Exam (Kinematics)	26 Universal Gravitation; Friction	27 Newton's Laws for Rotation Lab: Newton's Second Law	28 Group Problem: Newton's Laws	29 Work and Kinetic Energy Homework Assignment #4 Due	30
Reading		Serway §5.8, §13.1- 13.4,	Serway §10.4-10.6		Serway §7.1-7.2, 7.5, 10.7	

OCTOBER 2017

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	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT/SUN
						1
WEEK 5	2 Potential Energy Reading Serway §7.6, 13.5-13.6	3 No Class (Nobel Conference)	4 No Class (Nobel Conference)	5 Conservation of Energy; Power Reading Serway Chapter 8, §10.8	6 Group Problem: Energy	7/8
WEEK 6	9 Momentum Homework Assignment #5 Due Reading Serway §9.1-9.4	10 Center of Mass Reading Serway §9.6-9.7	11 Angular Momentum Lab: Reflection and Refraction Reading Serway §11.3-11.4	12 Reflection and Refraction Homework Assignment #6 Due Reading Serway §35.3-35.5	13 Dispersion; Luminosity and Apparent Brightness Reading Serway §35.7-35.8, Bennett pp. 487-488	14/15
WEEK 7	16 Second Hour Exam (Dynamics) Reading	17 Image Formation in Mirrors Reading Serway §36.1-36.2	18 Image Formation in Lenses Lab: Lenses Reading Serway §36.3-36.4	19 Telescopes Reading Serway §36.10, Bennett Chap. 6	20 Group Problem: Geometric Optics	21/22
WEEK 8	23 No Class (Fall Break)	24 No Class (Fall Break)	25 Light as a Wave Homework Assignment #7 Due Reading Serway §16.1-16.2, Bennett §5.1-5.2	26 Interference, Thin Films Lab: Interference and Diffraction Reading Serway §37.1-37.5	27 Diffraction, Resolution and Polarization Reading Serway §38.1-38.4, 38.6	28/29
WEEK 9	30 Spectroscopy, Doppler Effect Reading Bennett §5.4, Serway §17.4	31 Quantum Optics Reading Serway §40.1, 40.4-40.7, 42.1-42.3, 42.8, 43.2				

NOVEMBER 2017

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Fall 2017

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT/SUN
WEEK 9			1 Group Problem: Wave Optics Lab: Spectroscopy	2 Temperature Homework Assignment #8 Due Serway Chap. 19	3 Heat and Thermal Energy; Heat Transfer Serway §20.1-20.3, 20.7; Bennett 5.3	4/5
WEEK 10	6 Third Hour Exam (Optics) Reading Bennett §15.1	7 Kinetic Theory Serway §21.1,21.5	8 The Nebular Theory Lab: Radioactivity Bennett Chapter 8	9 Group Problem: Thermodynamics	10 Nuclear Isotopes, Binding Energy, Fission & Fusion Homework Assignment #9 Due Serway §39.8, 44.1-2,45.2-4	11/12
WEEK 11	13 Radioactivity Comparative Planetology – Geology Reading Serway 44.4-44.6; Bennett Chap. 9	14 Comparative Planetology - Atmospheres Bennett Chap. 10	15 Exoplanets Lab: Greenhouse Effect Bennett Chap. 13	16 The Sun Bennett Chap. 14	17 Group Problem: The Solar System	18/19
WEEK 12	20 Stars Homework Assignment #10 Due Reading Bennett §15.1	21 Fourth Hour Exam (Thermodynamics & Solar System)	22 No Class (Thanksgiving Break) No Lab	23 No Class (Thanksgiving Break)	24 No Class (Thanksgiving Break)	25/26
WEEK 13	27 HR Diagrams Reading Bennett §15.2- 15.3	28 Birth of Stars and Stellar Life Cycles Bennett Chap. 16	29 Stellar Life Cycles and Star Deaths Lab: HR Diagrams Bennett Chap. 17- 18	30 Group Problem: Stars		

DECEMBER 2017

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Fall 2017

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT/SUN
WEEK 13					1 The Milky Way	2/3
notes					Bennett Chap. 19	
WEEK 14	4 Survey of Galaxies	5 Galaxy Evolution	6 Big Bang Cosmology Lab: Hubble's Law	7 Fate of the Universe	8 Group Problem: Galaxies and Cosmology Homework Assignment #11 Due	9/10
notes	Bennett Chap. 20	Bennett Chap. 21	Bennett Chap. 22	Bennett Chap. 23		
WEEK 15	11 Fifth Hour Exam (Stars, Galaxies and Cosmology)	12 Observing Project Presentations	13 Observing Project Presentations	14 No Class (Reading Day)	15	16/17
notes						
	18	19 Final Exam (3:00- 5:00 pm)	20	21	22	23/24
notes						
	25	26	27	28	29	30/31
notes						
notes						

