

# PHY195 The Cosmic Universe

Gustavus Adolphus College Fall 2018

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**Office Hours:** [physics.gac.edu/~huber/schedule.htm](http://physics.gac.edu/~huber/schedule.htm)

**Course Assignments and Resource Page:** 2018 f-phy-195-001 Page at [moodle.gac.edu](http://moodle.gac.edu)

**Textbooks:** *Physics for Scientists and Engineers with Modern Physics* (9<sup>th</sup> Edition), by Serway and Jewett  
*The Cosmic Perspective* (7<sup>th</sup> 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 12:30-1:20pm. 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 *preliminary* 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. **Attendance:** Regular attendance at all class meetings is expected. Students will be held responsible for informing themselves of all announcements/assignments made in class.
3. **“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.
4. **Pre-class, Online Reading Quizzes:** For some assigned readings, 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](http://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 12:15 pm.**

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 (***MAKE SURE THAT YOU SAVE THIS CODE AS YOU WILL NEED IT IN FUTURE SEMESTERS***)

Each student should self-enroll for PHY195-001 using the course code listed below

PHY195-001 - gustavus 0055 2933

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.
6. **Course Communication:** Email is an official means for communication at Gustavus Adolphus College. I expect that you will check your *Gustavus email* at least once per day. Course assignments and other resources will be posted to the Moodle page for this course. Reading quizzes and pre-lab quizzes will be posted to Webassign.
7. **Programming:** Each homework assignment will include one computer problem, to be completed using the Python programming language. Our platform for Python programming is <http://www.glowscript.org>
8. **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.
9. **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.
10. **Exams:** There will be four one-hour exams and a two-hour final exam. The date for each of the exams is given in the calendar below. The score of the lowest one-hour exam will be given half weight in the final grade for the course. 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. **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](http://www.gustavus.edu/general_catalog/current/acainfo)).

11. <b>Evaluation :</b>	Homework	25%
	Online Reading Quizzes	10%
	Group Problem Solutions	10%
	Hour Exams	40%
	<u>Final Exam</u>	<u>15%</u>
	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%	

Assignment of final letter grades will also take into account the instructor's subjective evaluation of the student's attendance, initiative, preparation (particularly quantity and quality of homework), and evidence of improvement.

11. **Incompletes:** A grade of incomplete may be awarded at the discretion of the instructor, if requested by the student, under the following conditions: 1) the last day to withdraw has passed, 2) and unforeseen circumstances beyond the student's control (usually restricted to illness or family emergency) preclude completion of the remaining work for the course by the semester deadline. See Academic Catalog for official policies.
12. **Getting Help:** If you have trouble with any aspect of the course, make sure you let me know as early as possible. By being proactive in reaching out for assistance, I can better help you identify strategies for success.
13. **Tutoring:** The physics department has tutoring available Sunday through Thursday evenings in Olin 216. Upper division physics students are available to help you with your questions.
14. **Help for Multilingual Students:** 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). They 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 Carly 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.

15. **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 (e.g., mental health, attentional, learning, chronic health, sensory, or physical) 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 Accessibility Resources 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 Accessibility Resources as early as possible. Accessibility Resources (<https://gustavus.edu/care/accessibility/>) is located in the Center for Academic Resources and Enhancement.
16. **Mental Wellbeing:** The Gustavus community is committed to and cares about all students. Strained relationships, increased anxiety, alcohol or drug problems, feeling down, difficulty concentrating, and/or lack of motivation may affect a student's academic performance or reduce a student's ability to participate in daily activities. If you or someone you know expresses such mental health concerns or experiences a stressful event that can create barriers to learning, Gustavus services are available to assist you. You can learn more about the broad range of confidential health services available on campus at <https://gustavus.edu/counseling/and> <https://gustavus.edu/deanofstudents/services/>.
17. **Title IX: Sexual Misconduct Prevention and Resources:** Gustavus Adolphus College recognizes the dignity of all individuals and promotes respect for all people. As such, we are committed to providing an environment free of all forms of discrimination including sexual and gender-based discrimination, harassment, and violence like sexual assault, intimate partner violence, and stalking. If you (or someone you know) has experienced or is experiencing these types of behaviors, know that you are not alone. Resources and support are available; you can learn more online at <https://gustavus.edu/titleix/>. Please know that if you choose to confide in me, I am mandated by the College to report to the Title IX Coordinator, because Gustavus and I want to be sure you are connected with all the support the College can offer. Although it is encouraged, you are not required to respond to outreach from the College if you do not want to. You may speak to someone confidentially by contacting the Sexual Assault Response Team (SART/CADA), Chaplains, Counseling Center, or Health Service staff; conversations with these individuals can be kept strictly confidential. SART/CADA can be reached 24 hours a day at 507-933-6868. You can also make a report yourself, including an anonymous report, through the form at <https://gustavus.edu/titleix/>.

# SEPTEMBER 2018

Preliminary Schedule:  
SUBJECT The Cosmic Universe

Fall 2018

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

# OCTOBER 2018

Preliminary Schedule:  
SUBJECT The Cosmic Universe

Fall 2018

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

# NOVEMBER 2018

Preliminary Schedule:  
SUBJECT The Cosmic Universe

Fall 2018

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

# DECEMBER 2018

Preliminary Schedule:  
SUBJECT The Cosmic Universe

Fall 2018

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT/SUN
WEEK 13						1/2
notes						
WEEK 14	3 Survey of Galaxies	4 Galaxy Evolution	5 Big Bang Cosmology  Lab: Hubble's Law	6 Fate of the Universe	7 Group Problem: Galaxies and Cosmology <b>Homework Assignment #11 Due</b>	8/9
notes	Bennett Chap. 20	Bennett Chap. 21	Bennett Chap. 22	Bennett Chap. 23		
WEEK 15	10 Catch Up / Review	11 Catch Up / Review	12 Catch Up / Review	13 Catch Up / Review	14 <b>Final Class Day</b>	15/16
notes						
WEEK 16	17	18 <b>Final Exam</b> (10:30 am – 12:30 pm)	19	20	21	22/23
notes						
WEEK 17	24	25	26	27	28	29/30
notes						
WEEK 18	31					
notes						