General Physics I

PHYS - 2110
Spring Semester, 2021

Dr. Steven Gollmer
Office: ENS 357
Email: gollmers@cedarville.edu
Phone: Office: ext. 7764

Office Hours: M,W,F: 2:00 – 2:50
T, Th: 1:00 – 1:50
Open Door Policy(See below)

Text: *University Physics Vol.1 (2018)*, by Ling, Sanny and Moebs (ISBN: 978-1-938168-27-7). We will cover Chapters 1 – 17. For the laboratory, you will be using handouts provided by me.

Co or Prerequisite: MATH 1720 (Calculus II)

Class Room: SSC Theatre
Class Time: 12:00 - 12:50 M W F

Lab Room: ENS 236
Lab Time:

Section 1	3:00 – 4:50 M
Section 2	8:00 – 9:50 Tu
Section 3	3:00 – 4:50 Tu
Section 4	3:00 – 3:50 W
Section 5	3:00 – 4:50 Th
Section 6	8:00 – 9:50 Th

Class Web Page: http://stevegollmer.people.cedarville.edu/phys2110/phys2110.htm
Canvas Site: https://www.cedarville.edu/canvas

Course Description:

PHYS 2110 – General Physics I   **4 hours**
Basic concepts of mechanics using calculus. This is the first of a three-semester sequence intended for students in the physical sciences and engineering programs. Topics include linear and rotational motion in three dimensions, oscillatory motion, gravitation, fluid mechanics and basic concepts of wave motion. Three lectures and one two-hour laboratory per week.
Prerequisites or Co-enrolled: MATH-1720 Calculus II or permission of instructor. (Fee: $100)

Objectives:

Theory/Concepts: The student will be able to recall physical principles related to motion, Newton's Laws, conservation principles, oscillators and waves. In addition he/she will apply these principles by solving a wide range of physics problems using the appropriate mathematical techniques.

Analysis: The students will develop problem-solving skills and be able to analyze problems related to motion, Newton's Laws, conservation principles, oscillators and waves.

Laboratory: The student will be able to analyze concepts related to motion, Newton's Laws, conservation principles, oscillators and waves by comparing them to observed phenomena and testing them in the laboratory setting.

Community: The student will reflect on the beauty of God's creation as found in physics and apply their understanding to serve God and others. (Psalm 8:3-4)

Assessment Mapping	Theory / Concepts	Analysis	Laboratory	Community
Exams	X	X		
Final Exam	X	X		
MasteringPhysics	X	X		
Quizzes	X	X		
Application Projects				X
Laboratory	X	X	X	

Grading:

300	3 Unit Exams (100 pts each)	Grading Scale		
150	1 Final Exam (comprehensive)	90% and up:	A	
76	Online Homework (~5 pts each chapter)	80% and up:	B	
50	Quizzes (10 pts each, best 5 of 6 quizzes)	70% and up:	C	
30	Application Projects (15 pts each)	60% and up:	D	
144	Laboratory (12 pts each)	Below 60%:	F	
750	Total			

(–) Lowest 3 percentage points in a grade range.

(+) Highest 3 percentage points in a grade range except for an A.

NOTE: A passing grade in the lab is a prerequisite to passing the course. An F on the labs means an F for the course. **DO NOT** ignore the labs.

The results for all exams, quizzes, homework, etc. will be given a point score. For example a 7 on a quiz means 7 out of 10 points were earned on the quiz. The calculation of the final grade will be the result of a straight percentage from the points accumulated during the course of the semester. Though no "curving" of the final grade will be done, I reserve the option of raising a student's final grade due to their good attitude, class participation and marked improvement during the course of the semester.

Topics:
The following topics will be covered during the course of the semester. Timing of these topics is reflected in the schedule.

Motion
- Velocity
- Acceleration
- Instantaneous & Average
- Kinematic Equations
- Gravity
- Vector Motion
- Galilean Transforms
- Projectile Motion
- Circular Motion

Newton's Laws
- Newton's 1st Law
- Newton's 2nd Law
- Newton's 3rd Law
- Free-body Diagrams
- Friction
- Hooke's Law

Conservation Principles
- Work
- Kinetic Energy
- Potential Energy
- Law of Gravity
- Kepler's Laws
- Center of Mass
- Momentum
- Collisions

Rotational Motion
- Angular Velocity
- Angular Acceleration
- Rotational Kinetic Energy
- Torque
- Vector Cross Product
- Moment of Inertia
- Angular Momentum
- Center of Gravity
- Equilibrium

Oscillators and Waves
- Simple Harmonic Oscillator
- Pendulums
- Resonance
- Wave of a String
- Sound Waves
- Standing Waves
- Doppler Effect

Exams:
3 unit exams and one comprehensive exam will be given during the course of the semester. Though each unit exam only covers material from the previous unit exam, there is a building of concepts, which will show up in later exams. Problems on the exam will be similar to problems which exist in the textbook and on the quizzes. The final exam is comprehensive and will be similar to the unit exams except for length.

Quizzes:
6 quizzes are scheduled during the semester. These will give you a chance to see how I ask questions and will prepare you for the unit exams. Only the 5 highest quizzes will be kept for a grade. Therefore, the lowest quiz of the semester will not be included in your grade for the semester. If you miss a quiz due to an unexcused absence, it will be recorded as a zero and, therefore, would be your lowest quiz for the semester.

WebAssign:

For each chapter there will be a WebAssign assignment worth 5-6 points, except for the last two chapters, which are combined into a single assignment. When a chapter is completed in class, the appropriate assignment will be available through WebAssign. You will have at least two days to complete this assignment. In some cases more time is allowed. You need to check the due date by logging into WebAssign. If the assignment is not completed by the due date, you may request an extension with a late penalty. Depending on how late the extension is, the penalty may be up to 50%, off the value of the assignment. See my late policy.

As you do the assignment, take care to use the proper number of significant digits, proper units and signs. I will give you three tries to get the right answer. If the question is multiple choice, you will not get credit if you exhaust all the possible answers before your three tries are completed. I recommend that you work through the WebAssign problems on a separate sheet of paper and then enter the answer when you are done. That way if you don't understand why the answer is as it is, you can bring your work to my office and we can go over it together. A number of the problems from WebAssign are from your textbook. However, the numerical values may be different. Go by the information provided by WebAssign and do not rely on answers from the back of the textbook. You should not use these assignments as your only problem solving practice, but in conjunction with the non-graded homework problems. Treat the WebAssign assignments as open book quizzes.

Links to assignments are available in Canvas. Just click on the link and it will take you to WebAssign. The first time you access WebAssign it may ask you to activate an access key. The access key can be purchased at that time. If you purchased a multiple

semester access key in the spring, it should be usable for this course. If you have problems activating WebAssign, contact Cengage's support services.

Homework:
Homework is the key to being successful in physics. If you become proficient at solving the homework problems, you will do well in the course. MasteringPhysics provides a means of having graded homework. Non-graded homework problems are listed below and will provide a sample of problem types that you should be able to solve for the class. Solutions to the non-graded problems are available on the class web site.

You are encouraged to work together when doing non-graded homework. Forming a study group will give you accountability to stay current on the course material, provide input when you get stuck on solving problems and provide an opportunity to clarify your thinking about physics as you explain a problem to others.

Application Projects:
There are 2 application projects due during the course of the semester. They are worth 15 pts each and are assigned during the weeks you do not have lab. You will be provided with a description of the project and the expectations of what you are to do. Each of these projects will require you to do several hours of research and reading. You will also write up the results of your work and turn it in for grading.

Laboratory:
The laboratory sessions are considered a vital part of this course. So much so that an F on the labs means an F for the course. You must have a passing grade on your labs in order to pass the class. While the homework will help you develop computational skills and problem solving, the labs will develop observational and experimental skills. There will also be an emphasis on quantifying observations and using the computer to hasten your computations. There is also an emphasis on communication since you must convey to me what you have learned.

The following laboratory procedure should be followed:

1.   Read the experiment description completely before coming to the lab and complete any pre-lab questions. The pre-lab will be available through Canvas. Read through the pre-lab and answer the Canvas pre-lab questions. Each pre-lab is worth 2 pts.
2.   A hard copy of the lab instructions and data sheet will be provided when you come to lab. Check the blackboard in lab for special instructions and explanations that may not appear in the lab sheet.
3.   Check the apparatus.
4.   Perform the activity, following procedure step-by-step, recording data and making calculations accordingly including estimates of uncertainty.
5.   Complete all tables, graphs, calculations and questions suggested in the laboratory section of the laboratory handout. An Excel spreadsheet is provided to assist in this process. Although you collect data and generate plots in a group, you should perform your own calculations and answer questions in your own words to reflect your understanding of the question.
6.   Lab reports will be submitted electronically via Canvas. A template of the report is provided in the form of a post-lab file. This file can be downloaded from Canvas. The submitted lab will be a single Word document with Excel data and plots inserted in it. Since you will be cutting and pasting from Excel, make sure the data can be read in your Word document. That means the words shouldn't be too small to read and the table and graphs should not bleed off the edge of the page. Unacceptable formatting can result in loss of credit. Each post-lab is worth 10 pts.

Calculator Policy
You have been given a scientific calculator for use in your General Physics sequence (I, II, & III). You are expected to use this calculator for quizzes and exams in these classes. If you forget to bring this calculator to a quiz or exam, an extra calculator will be provided with a grade penalty as determined by the instructor. If you lose your calculator or it is no longer in working condition, you are responsible to obtain your own replacement calculator of the same type. For this particular class the first time you forget your calculator for a quiz or exam, there will not be a penalty. However, for any subsequent quizzes or exams there will be a 2 point deduction for borrowing a calculator.

Late Work:
Late work will be accepted with a penalty. Late projects and labs will be docked 10% if turned in within the first week and 20% thereafter. If late work is turned in during finals week 50% of the value of the homework will be docked unless it falls under the category of being within the first week. (Note: The penalty for late work is different than the WebAssign late penalty. In the case of WebAssign you need to request an extension on the assignment.)

Extra Credit:
No extra credit is available for this class. It is felt that spending time working on extra credit distracts from staying current on the material and preparing for the next graded activity.

Academic Integrity:

"The Academic Integrity Pledge is a commitment to live with integrity in all areas of life including the classroom. All forms of academic dishonesty violate this pledge and could result in dismissal from this community."

Although I encourage group efforts in studying, homework and lab work, I still expect you to turn in your *own* work. If your work appears to be copied from another person's lab or homework, your assignment will be returned with either a zero or returned with the intent of a redo with a loss of credit. Which of these two options is chosen is at the discretion of the instructor.

During quizzes and exams you are required to do your own work. If during the quiz or examination time you receive help from an unauthorized source (ie. class mates, wireless access to the network, etc.), your quiz or exam will receive a zero and the Office of the Academic Vice-President will be notified.

Appeal Process:
Our commitment as faculty is to provide you with the best possible educational experience this semester. If a concern arises during the semester about this course, I encourage you to discuss the issue with me. If you believe that the outcome of that meeting did not resolve the issue, you are encouraged to seek help from the department chair of Science and Mathematics, Dr. Mark McClain. The formal grade appeal process can be found at www.cedarville.edu/gradeappealprocess.Dr. McClain can be contacted by email (mcclain@cedarville.edu), by phone (937-766-7933), or at his office (ENS 380A).

Academic Accommodations:
Disability Services coordinates reasonable accommodations for students with documented disabilities. Students in need of academic accommodations because of the impact of a disability are invited to e-mail the Disabilities Compliance Coordinator at disabilityservices@cedarville.edu or visit www.cedarville.edu/disabilities for information and an application. **Disability Services** is located in **The Cove (Academic Enrichment Center)** on the second floor of the BTS.

Attendance:
Attendance will be taken each day of class. Though it does not get recorded as a grade, it will be to your benefit to be present for class. One example is that a missed quiz will be recorded as a zero unless the absence is excused. Also material will be presented differently than in the book since I will endeavor to illustrate some of the physical principles, generate discussion about issues related to physics and include Biblical perspectives on these physical principles. Faithful attendance also demonstrates a good stewardship of the time and money with which God has entrusted you.

Open Door Policy:
I have one hour per day scheduled for office hours. You may also drop by my office at any other time whether it is class related or not. As long as I am present in my office and I do not have any pressing work that needs to be done, I will meet with you. I am privileged to have this ministry at Cedarville University. Whether you recognize it or not, God has put me in your life this semester to minister to you.

Assessment Criteria:
This course is used by the following programs to satisfy assessment criteria.

Teacher Education Program Unit and Program Assessments Assigned to Course

Unit Outcome	Program Outcome	Decision Points	Assessment
Competence	NSTA Std 1a.	4	#1 Content Knowledge
Competence	NSTA Std 1a.	1, 2, 3, 4	#2 Content Knowledge

Alignment with NCATE/NCTM standards:
- 1.2 Solve problems that arise in mathematics and those involving mathematics in other contexts.
- 4.2 Recognize and apply mathematics in contexts outside of mathematics.
- 15.1 Recognize the common representations and uses of measurement and choose tools and units for measuring.
- 15.2 Apply appropriate techniques, tools, and formulas to determine measurements and their application in a variety of contexts.
- 15.3 Completes error analysis through determining the reliability of the numbers obtained from measures.

Unit Outcome	Program Outcome	Decision Point	Assessment
	2—Content Knowledge: GPA in select courses	2—completion of Teaching Math	GPA in course

Addendum to the Syllabus:
Due to dynamics present during the course of the semester, the instructor may make adjustments to the printed schedule. However, if any changes are made to content coverage or dates of exams, students will be notified either in class or by email.

Conclusion:
Use this semester in physics well. Physics is not purely knowledge, facts or information, but a skill. You need to practice this skill correctly in order to become proficient with it. 2 hours of study outside of class for each hour in class is recommended to be successful in this class. If you are weak in your calculus and problem solving skills you may need to invest even more time.

I hope your appreciation for physics will grow during this semester even though it will require a sustained amount of effort. Physics is a foundation for all other sciences since it attempts to quantify how this universe works from the largest to the smallest scales. The basic laws and structure present in the universe were created and are maintained by God (Col. 1:17) and provide illustrations of God's majesty and power.

COVID-19 and Online Resources

Due to the Covid-19 pandemic, timing and mode of delivery for course content may change. As stated above, I reserve the right to make changes as I feel are necessary. Students must comply with safety requirements as directed by the University. I expect students to wear masks and/or face shields in class and lab. In addition, disposable gloves will be available for use in the lab. Although we are operating with the assumption that we will have face-to-face instruction throughout the semester, there will be some students unable to attend due to infection or quarantine. I plan on recording each class session and making a link available through Canvas. As a result, you will show up on the posted videos. These videos will be for use by the class and will not be publicly distributed.

In Case of Illness: If you are ill or feel you are coming down with something, please do not come to class. I will work with you to make up any missed material, assignments, quizzes, exams or labs. This class is one in which we do not have sufficient space to spread out. As a result, if one person comes down with COVID, this could potentially place 20+ students into quarantine. **If your condition is doubtful, don't come. You will not be penalized for not attending class.**

Ungraded Homework Problems

These problems will not be graded or handed in; however, they will prepare you for the MasteringPhysics assignments and exams. Solutions are available on the network by accessing the web page for this class. If you have any questions about the solutions or your find errors in the solutions, please contact me so I can correct them.

Chapter 1 – 22, 26, 28, 30, 40, 52, 63, 75, 77, 83, 86

Chapter 2 – 38, 43, 46, 48, 52, 54, 60, 66, 68, 75, 80, 84

Chapter 3 – 28, 30, 35, 38, 46, 56, 61, 68, 76, 78, 86, 98, 102

Chapter 4 – 21, 26, 31, 34, 40, 46, 54, 63, 76, 91, 97

Chapter 5 – 22, 26, 32, 48, 54, 67, 72, 82, 87, 90, 104, 106

Chapter 6 – 26, 30, 44, 48, 54, 61, 64, 72, 77, 95, 100, 116, 120

Chapter 7 – 28, 34, 40, 42, 51, 54, 62, 58, 76, 80, 88, 106

Chapter 8 – 26, 36, 38, 41, 43, 50, 55, 60, 75, 78

Chapter 9 – 22, 30, 34, 37, 41, 45, 46, 58, 60, 70, 76, 95, 97

Chapter 10 – 36, 40, 44, 48, 54, 63, 65, 70, 77, 80, 92, 98, 103

Chapter 11 – 23, 28, 32, 37, 42, 48, 53, 68, 72

Chapter 12 – 28, 30, 34, 39, 42, 70

Chapter 13 – 22, 26, 32, 39, 40, 46, 68

Chapter 14 – 46, 50, 52, 62, 66, 75, 80, 86

Chapter 15 – 26, 29, 32, 34, 44, 49, 53, 58, 62

Chapter 16 – 16, 40, 44, 50, 56, 60, 68, 92, 109, 112

Chapter 17 – 40, 50, 60, 66, 80, 82, 90, 98, 102, 114

	Date	Ch.	Topic	Activities			Date	Ch.	Topic	Activities
			PHYS2110 - General Physics I			M	3/8	8	Conservation of Energy	
						W	3/10		**Exam #2 Ch. 5-8**	
W	1/20	1	Introduction			F	3/12	9	Momentum and Impulse	
F	1/22	1	Units, Sig. Figs. & Estimation			**Lab**			**No lab this week**	
Lab			**No lab this week**			M	3/15	9	Conservation of Momentum	
M	1/25	2	Scalars and Vectors			W	3/17	9	Center of Mass	
W	1/27	2	Vector Components			F	3/19	10	Angular Velocity & Moment of Inertia	
F	1/29	2	Vector Multiplication	Q1		**Lab**	7		**Air Track Collisions**	
Lab	1		**Measurement**			M	3/22	10	Rotational Energy	Q4
M	2/1	3	Displacement, Velocity & Acceleration			W	3/24	10	Torque	
W	2/3	3	Free Fall			F	3/26	11	Angular Momentum	
F	2/5	3	Kinematic Equations			**Lab**	8		**Center of Mass, Balance, Levers**	
Lab	2		**Air Track Timing**			M	3/29	11	Conservation of Angular Momentum	
M	2/8	4	Projectile Motion	Q2		W	3/31	12	Static Equilibrium	Q5
W	2/10	4	Relative Motion			F	4/2	12	Stability and Statics Problems	
F	2/12	4	Circular Motion			**Lab**	9		**Moment of Inertia**	
Lab	3		**Air Track Acceleration**			M	4/5		**Exam #3 Ch. 9 - 12**	
M	2/15		**Exam #1 Ch. 1 - 4**			W	4/7	15	Oscillatory Motion	
W	2/17	5	Newton's Laws			F	4/9	15	Mechanical Oscillators	
F	2/19	5	Weight and Forces			**Lab**	10		**Physical Pendulum**	
Lab	4		**Coefficient of Kinetic Friction**			M	4/12	15	Damped & Forced Oscillators	
M	2/22	5	Free-Body Diagrams			W	4/14	16	Waves	
W	2/24	6	Friction	Q3		F	4/16	16	Standing Waves on a String	Q6
F	2/26	6	Centripetal Force			**Lab**	11		**Wave on a String**	
Lab	5		**Ballistic Pendulum and Gravity**			M	4/19	17	Sound Waves	
M	3/1	7	Work			W	4/21	17	Standing Waves in Pipes	
W	3/3	7	Kinetic Energy			F	4/23	13	Gravity	
F	3/5	8	Potential Energy			**Lab**	12		**Standing Waves in a Tube**	
Lab	6		**Elastic-Kinetic Energy**			M	4/26	14	Fluids	
						W	4/28		**Final Exam (12:00 - 1:50)**	