

General Physics III

PHYS - 2130

Fall Semester, 2017

Dr. Steven Gollmer

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Office Hours: M, W: 2:00 – 2:50

T, Th: 1:00 – 1:50 F: 9:00 – 9:50

Open Door Policy(See below)

Text: *Essential University Physics Vol. 1 & 2 3rd Edition*, by Wolfson. We will cover Chapters 16 – 19 and 33 – 39.

Prerequisite: PHYS 2110 (First semester calculus based physics)

Class Room: BTS 117

Class Time: 11:00 - 11:50 T Th

Class Web Page: <http://people.cedarville.edu/employee/gollmers/phys2130/phys2130.htm>

Course Description:

PHYS 2130 – General Physics III - FA

2 hours

Basic concepts of thermodynamics and modern physics using calculus. This is the third of a three-course sequence intended for students in the physical sciences programs. Topics include heat and thermodynamics, relativity theory, quantum theory, atomic and nuclear physics.

Prerequisites: MATH-1720 Calculus II; PHYS-2110 General Physics II; PHYS-2120 may be co-enrolled with permission of instructor.

Objectives:

Theory/Concepts: The student will be able to recall physical principles related to thermodynamics, modern physics, from relativity to quantum mechanics and solid state physics. They will apply these principles by solving a variety of problems.

Analysis: The students will develop problem-solving skills and be able to analyze problems related to the above physics laws.

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	Community
Exams	X	X	
Final Exam	X	X	
MasteringPhysics	X	X	
Quizzes	X	X	
Application Projects			X

Grading:

200	2 Unit Exams (100 pts each)
150	1 Final Exam (comprehensive)
40	Mastering Physics (5 pts each chapter)
40	Quizzes (10 pts each, best 4 of 5 quizzes)
20	Application Project
450	Total

Grading Scale

90% and up:	A
80% and up:	B
70% and up:	C
60% and up:	D
Below 60%:	F

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

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.

Exams:

2 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 some 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:

5 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 4 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.

Topics:

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

Thermodynamics

- Temperature
- Kinetic Theory
- Heat Capacity
- Latent Heating
- Heat Transport
- Ideal Gas
- PV Diagrams
- Thermodynamic Cycles
- Efficiency
- Entropy

Relativity

- Michaelson Experiment
- Special Relativity
- Time Dilation
- Length Contraction
- Relativistic Momentum
- Relativistic Energy
- Lorentz Transform
- Simultaneity
- General Relativity

Atomic & Solid State Physics

- Bohr Model for Hydrogen
- Compton Scattering
- Quantum Numbers
- Atomic Orbitals
- Band Gaps
- Lasers

Quantum Physics

- Black Body Radiation
- Planck's Constant
- Photoelectric Effect
- Heisenberg Uncertainty
- Schrodinger's Equation

Nuclear Physics

- Stability of Isotopes
- Decay Processes
- Radioactive Decay
- Radiometric Dating
- Fission
- Fusion

MasteringPhysics:

For each chapter there will be a MasteringPhysics assignment worth 5 points. When a chapter is completed in class, the appropriate assignment will be available through MasteringPhysics. 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 MasteringPhysics. As a reminder, the class schedule has an abbreviation of MP16, MP17, etc. to remind you when you need to work on this assignment. If the assignment is not completed by the due date, it will still be available; however, there will be a 10% deduction of value for each day you are late. Once the deduction gets to 50%, it will stay at that level for the rest of the semester. Therefore, it is always worthwhile to complete assignments, even if they are late.

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. Each incorrect answer will result in a 3% deduction on the question value. After three tries, you will not get any credit for that question. 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 MasteringPhysics 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 MasteringPhysics are from your textbook. However, the numerical values may be different. Go by the information provided by MasteringPhysics and do not rely on answers from the back of the textbook.

To access MasteringPhysics you must have your own personal access key, which comes with a new textbook. If you bought a used text, then you must purchase a MasteringPhysics key from their website. **(If you have an access key from last semester, it will be good for this semester.)** Once you are registered, log into your account at <http://www.masteringphysics.com>. You will need to change the course you are enrolled in. The new course name is called *CU Gollmer P2130 Fa2017*. You should not use these assignments as your only problem solving practice, but in conjunction with the suggested homework problems. Treat the MasteringPhysics assignments as open book quizzes.

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.

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.

Application Project:

There is an application project due during the course of the semester. It is worth 20 pts and is assigned near fall break. You will be provided with a description of the project and the expectations of what you are to do. These project 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.

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.

Late Work:

Late work will be accepted with a penalty. Late homework 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. Homework that is late due to an excused absence (prior arrangement with me or medical excuse) will not be docked if turned in the following class period.

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 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, I encourage you to discuss the issue with me or, if you wish to remain anonymous, you may share your concern Dr. Dennis Flentge, Chair of the Department of Science and Mathematics. He will work to resolve the issue. If the concern is about grading assignments or exams, your first responsibility is to speak with me. If you believe that the outcome of that meeting did not resolve the issue, you may appeal to Dr. 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 (extension 7940) or in 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 College. Whether you recognize it or not, God has put me in your life this semester to minister to you.

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

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.

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.

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 16 – 20, 27, 33, 39, 45, 52, 55, 57, 60, 67, 70, 81

Chapter 17 – 18, 24, 28, 34, 36, 37, 44, 52, 57, 62, 67, 70

Chapter 18 – 19, 22, 28, 31, 32, 39, 41, 51, 57, 66, 68, 77

Chapter 19 – 14, 27, 29, 33, 37, 42, 43, 60, 67

Chapter 33 – 15, 16, 32, 33, 36, 43, 46, 54, 57, 60, 73

Chapter 34 – 19, 20, 27, 30, 36, 41, 43, 49, 52, 61, 65, 68, 69

Chapter 35 – 13, 17, 23, 28, 31, 34, 42, 47, 51, 55

Chapter 36 – 19, 26, 28, 32, 35, 40, 45, 51, 54

Chapter 37 – 18, 20, 25, 28, 32, 41, 48, 55

Chapter 38 – 19, 27, 35, 45, 49, 53, 68, 71

	Date	Topic	Topic	Reading		Date	Topic	Topic	Reading
			PHYS 2130 - General Physics III						
Th	8/24	16	Temperature and Heat		T	10/17	34	Particles and Waves	Q3
					Th	10/19		<i>Fall Break - No Class</i>	
T	8/29	16	Temperature and Heat		T	10/24	34	Particles and Waves	
Th	8/31	17	Thermal Behavior of Matter	Q1	Th	10/26	34	Particles and Waves	
T	9/5	17	Thermal Behavior of Matter		T	10/31	35	Quantum Mechanics	Q4
Th	9/7	17	Thermal Behavior of Matter		Th	11/2	35	Quantum Mechanics	
T	9/12	17	Linear Coefficient of Expansion		T	11/7	35	Quantum Mechanics	
Th	9/14	18	Heat and Work	Q2	Th	11/9		Review	
T	9/19	18	Heat and Work		T	11/14		Exam #2 Ch. 19, 33 - 35	
Th	9/21		Review		Th	11/16	36	Atomic Physics	
T	9/26		Exam #1 Ch. 16 - 18		T	11/21	37	Solid State Physics	
Th	9/28	19	2nd Law of Thermodynamics		Th	11/23		<i>Thanksgiving Break - No Class</i>	
T	10/3	19	2nd Law of Thermodynamics	App Proj	T	11/28	38	Nuclear Physics	
Th	10/5	33	Relativity		Th	11/30	38	Nuclear Physics	
T	10/10	33	Relativity		T	12/5	38	Nuclear Physics	Q5
Th	10/12	33	Relativity		Th	12/7	39	Quarks to the Cosmos	
					T	12/12		Final Exam (10:30 - 12:30)	