General Physics with Calculus (PH 212, Summer 2018, 4 credits)

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Course Website URL: http://physics.oregonstate.edu/~hadlekat/
Prerequisites: MTH 254 and PH 212
Corequisite: MTH 254
Text: *Physics for Scientists and Engineers*, 4th edition, Knight
Additional Items: Access to MasteringPhysics which comes bundled with the textbook (including an *optional* workbook for no cost) at the OSU bookstore, and a Turning Technologies ResponseCard NXT hand-held communication device (clicker). The lab manual is a pdf file posted on Canvas.

This course is part of the **OSU Baccalaureate Core** and fulfills the requirement for study related to **Physical Science**. The **Baccalaureate Core Student Learning Outcomes** for this category are: 1) recognize and apply concepts and theories of basic physical or biological sciences, 2) apply scientific methodology and demonstrate the ability to draw conclusions based on observation, analysis, and synthesis, and 3) demonstrate connections with other subject areas.

What is Physics? Physics is more than a collection of facts and formulas, it is a dynamic discipline that encompasses everything in nature. Objects and motions that we experience in everyday life have underlying reasons, that can be fundamentally understood via frameworks in physics, including forces and conservation laws. Exotic and complex systems also must obey the same set of laws of physics as systems that are encountered every day.

The study of physics involves metacognition, thinking about how you think. While learning physics, keep reflecting on how you are learning. Focus on conceptual understanding as you learn to analyze simple systems, and extend into more complicated systems. Physics involves reasoning, making connections between the physical situation, graphic representations, and mathematics. During every step of the process, reflect back to the physical situation to consider what will happen and why. Be ready to apply what you have learned to new situations, extrapolating beyond the models you have developed for similar situations. Learn to recognize what kinds of tools or techniques are useful for any given physical situation.

Learning Outcomes: By the end of this course, you will be able to:

- understand how to represent and analyze motion for solids, oscillations and waves
- apply fundamental physics principles to analyze the behavior of physical situations under certain conditions, and to understand when to apply these laws, and how to extend these general situations to specific applications.
- make observations of physical behavior and find explanations that are consistent with the observations, apply these explanations and established laws to make predictions about outcomes of experiments, and test through experimentation
- represent information in multiple ways (diagrams, graphs, words, equations. etc.), and move from one representation to another, use these representations to set up problem solutions, predict the behaviors of systems, and to check the solutions to problems
- use critical thinking skills within physics problem solving

Critical thinking is a fundamental part of science and at the heart of physics. In many ways, Physics is the discipline of modeling and problem solving. In this course, you will be taught to consider new situations and make assumptions that allow you to make appropriate simplifications to apply to physical models. Critical thinking in this class is being able to:

- analyze an open-ended, new physical situation
- consider what assumptions and simplifications can be made to this situation
- break down the situation into manageable pieces
- apply the concepts learned to solve these pieces and put them together for a solution
- evaluate if the solution makes sense

We will use historical experiments and scientific development, contexts from other disciplines, and modern experiments at the frontiers of our knowledge to develop the ideas in the learning outcomes and for problem solving whenever possible. The learning outcomes and critical thinking will be developed through in class demonstrations, voting questions, peer-to-peer discussions, full-class discussions, in-lecture group work and lab work. They will be *formatively* assessed through voting questions and lab work, and *cumulatively* assessed during exams.

Lecture: Lecture meets for one hour, four times per week. The purpose of lecture will be developing conceptual understanding, working on representing phenomenon, practicing problem solving, and building understanding though observations and explanations of phenomena. Lecture is interactive. There will be times in lecture that you are strongly encouraged to talk with other students near you. However, due to the large size of the class it is disruptive if you talk while the instructor is talking. Questions, comments, and interruptions are welcome, but please raise your hand. Pre-printed notes won't be available.

Lab: The lab is the appropriate place for you to apply the tools and skills to explore more complex situations. The labs will get increasingly more open-ended, so eventually you will be able to do authentic physics modeling of real situations. Required lab write-ups will be completed during the lab period. The lab packet is posted on Canvas.

Textbook: Please read the textbook before lecture to help understand what occurs during lecture and ask productive questions. Most students also find it helpful to read the textbook after lecture to solidify what they learned during lecture. Think about the questions asked in the book and make note of what doesn't make sense to you so you can ask about it later. Most importantly, *don't fall behind* because most concepts build on those encountered earlier.

Communication: Communication will be through announcements given in lecture, posted on Canvas, and via email using onid accounts. You are expected to check these daily.

Exams: There will be three midterm exams and one final exam. The exams will consist of conceptual questions and worked problems, including all aspects of problem-solving required for homework: discussing the assumptions and concepts that apply, and evaluating the results. A formula sheet will be provided with each exam.

Bring a photo ID to each exam. **Any official exam conflict must be discussed and arrangements made with the instructor *before* the exam.** Unexcused absence will result in a zero for the exam, including the final. If you believe that an error was made in the grading of an exam question, bring your complete exam to the instructor *within one week* after the exams have been returned. Never make any alterations or additions to the exam itself.

Lab: Lab meets for three hours once per week, most weeks of the term. 10% of your grade is earned for attending and conducting all of the labs, and obtaining an *average* of at least two-thirds of the possible points for the lab reports over the course of the term. Each group will write one lab report *during* each lab. **You must pass lab in order to pass the course.** You need to read the lab material posted on Canvas each week **before** attending lab, to avoid spending class time grasping what the lab is about. The activities done in lab are not "cookbook" recipes, you will be largely designing your own lab experiments. You must turn in your lab report before any member of your lab group leaves. If the lab is not completed, you will need to schedule a make-up lab to complete it. You may make-up a maximum of two labs during the last week of class. Any lab scheduling issues should be addressed directly with the lab TAs.

If you score a zero on a lab for any reason, including absence or arriving late to class (after your Lab TA's cutoff time) or leaving early, you should plan to schedule a make-up lab. For each lab with a zero score, you will receive a **5% deduction on your *total course score***.

Recitation, PH 222: Recitation is not required, but strongly recommended. It consists of weekly group problem solving sessions. Recitations are taught by experienced TAs who can address individual problems and provide guidance in small group sessions.

Class participation points: The ResponseCard NXT system will be used for formative assessment during lecture. To get credit for clicker questions during a lecture, you must answer all of the questions for that day's lecture. Credit will be given for answers, whether they are correct or not. Please think about the question and answer to the best of your ability. You may only use one ResponseCard NXT remote during lecture. The use of multiple remotes is strictly forbidden.

Homework: Homework will be assigned on MasteringPhysics. For each assignment, a subset of the problems will be collected in lecture to check the aspects of the solutions that cannot be graded by MasteringPhysics. Written homework assignments will use the Required Solution Format posted in Canvas. Please print your name clearly at the top right-hand corner, the assignment number, and your lab section day and start time. Half of the grade for each homework assignment will come from MasteringPhysics and half from hand-written solutions. Neither written homework nor MasteringPhysics homework will be accepted after the due date.

Grade Scale: The grade scale is fixed. There is no curve in this course.

90 - 100% = A	85 - 89% = A-	82 - 84% = B+	78 - 81% = B
75 - 77% = B-	72 - 74% = C+	68 - 71% = C	65 - 67% = C-
62 - 64% = D+	58 - 61% = D	55 - 57% = D-	0 - 54% = F

Grading Breakdown:

- 15% for each midterm
- 25% Final exam
- 5% Homework
- 10% Class participation
- 15% Lab. Students who earned prior lab credit are automatically awarded these points. Failing the lab results in failing the course. You must pass the lab in order to pass the course.

Email Policy and Canvas Discussion Forums: There are forums to use for out-of-class discussion on Canvas. Please post any course policy, reading, content, or homework questions on Canvas in these forums. The instructor will respond to the forums daily during weekdays so that everyone can have access to the answers, and you are encouraged to post help for each other as well. If you have a question, then it is likely to be helpful to your classmates as well. Posts from classmates addressing content issues are also welcome. You're encouraged to help each other. Use these forums instead of emailing me directly for homework help unless you have a personal question or concern that will not be appropriate or helpful for everyone.

Calculators: You will need a calculator for lecture, recitation, lab and exams. **Graphing calculators, those with a solver feature and/or graphing window, and laptop or palmtop computers may not be used for exams.** You should have a scientific calculator that has trigonometric, logarithmic and exponential functions. If you want to know whether or not your calculator is acceptable or not for exams, then consult the instructor well before the first exam.

TA Office Hours: The TAs will hold hours in Wngr 334 afternoons from 12:00 to 5:00. A schedule will be posted outside Wngr 334. TA office hours start the second week of the term. There is also free tutoring available for anyone through the Women and Minorities in Engineering Program. Private tutoring is available, please go to the Physics Department office to see a list of available tutors.

Students with Disabilities: Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval please contact DAS immediately at 541-737-4098 or at http://ds.oregonstate.edu. DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

Academic Integrity: You will be expected to conduct yourself in a professional manner. Academic dishonesty such as plagiarism and cheating will not be tolerated. Therefore, students are expected to be honest and ethical in their academic work. Academic dishonesty is defined as an intentional act of deception in one of the following areas:

* cheating - use or attempted use of unauthorized materials, information or study aids,
* fabrication - falsification or invention of any information,
* assisting - helping another commit an act of academic dishonesty,
* tampering - altering or interfering with evaluation instruments and documents, or
* plagiarism - representing the words or ideas of another person as one's own.
* using multiple ResponseCard NXT units during a single lecture period

For more information about academic integrity and the University's policies and procedures in this area, please refer to the Student Conduct web site at: http://www.orst.edu/admin/stucon/achon.htm and the section on Academic Regulations in the OSU Schedule of Classes. Expectations for student conduct can also be found at http://oregonstate.edu/admin/stucon/achon.htm.

Course schedule

Week	Date	Chapter	Homework due	exams	Lab
1	M 6/25	22.1-5			Lab 1: Electric force
	T 6/26	22			
	W 6/27	22			
	Th 6/28	23			
2	M 7/2	23	hw 1		Lab 2: Electric field
	T 7/3	23			
	W 7/4	no class			
	Th 7/5	24			
3	M 7/9	22,23	hw 2	midterm 1	No lab
	T 7/10	24			
	W 7/11	25			
	Th 7/12	25			
4	M 7/16	25	hw 3		Lab 3: Electric potential
	T 7/17	26			
	W 7/18	26			
	Th 7/19	27			
5	M 7/23	24,25,26	hw 4	midterm 2	Lab 4: Circuits
	T 7/24	27			
	W 7/25	28			
	Th 7/26	28			
6	M 7/30	28	hw 5		Lab 5: Magnetism and current
	T 7/31	28			
	W 8/1	29			
	Th 8/2	29			
7	M 8/6	27,28	hw 6	midterm 3	Lab 6: Magnetic force
	T 8/7	29			
	W 8/8	30			
	Th 8/9	30			
8	M 8/13	30	hw 7		Lab Make-up
	T 8/14	31			
	W 8/15	31			
	Th 8/16	22-31	hw 8	final exam	

Dates are tentative and may be subject to change.

Written homework will be turned in at the start of class on the designated day.

MasteringPhysics homework will be due at 11:55 pm PT on the MasteringPhysics site.