

Class Meeting: **MWF** 10:10-11:30am

Class Location: Heg 102

Office Hours: **W** 1:45-2:45pm & **F** 4-5pm

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Course Description — We will explore the Physics of motion. This is a surprisingly rich pursuit; in particular, the art of doing physics turns out to be choosing what to ignore. The physical world around us is rich in detail and complexity and to study one facet we often must ignore another. In this course we will discover the unreasonable effectiveness of Newton's approach to this art and the resulting insights into *predicting* how things move and why. In particular, we will develop a full quantitative description of motion and its relationship to *force*, *energy* and *momentum*. You will become fluent at alternating between conceptual and quantitative forms of explanation, and polish your incisive, scientific thinking.

Text: *Fundamentals of Physics*, by D. Halliday, R. Resnick, and J. Walker (10th Ed, Aug 2013)

Week	Topics	Lab	Chap.
9/1	Describing motion: Position, velocity, acceleration	No Lab	5: pp 94-98 & 2 Radiolab: \leq kg
9/8	Vectors, vector products. 2-D and 3-D motion	Force Table	3 & 4
9/15	Projectile motion. Explaining motion: Forces	Ball Drop	4 & 5
9/22	Newton's laws of motion. Various forces.	Ballistic Motion	5 & 6
9/29	Hooke's law. Circular Motion. Work.	Exam 1	6 & 7
10/6	Work & energy. Potential Energy.	Drag motion	7 & 8
10/13	Fall Break 10/13-10/14 Energy	No Lab	8
10/20	Momentum & center of mass, Collisions	Energy & Mom.	9
10/27	Gravitation & Planetary Motion	Problem Solving	13
11/3	Rotation: angular quantities, torque, ang. mom.	Collisions	10 & 11
11/10	Torque and static equilibrium. Simple Harmonic Motion	Oral	11 & 15
11/17	Various oscillations.	Springs	15
11/24	Special Relativity. Thanksgiving 11/27-11/30	No Lab	37
12/1	Wave Motion. Sound and other waves.	Rotation	16 & 17
12/8	Thermodynamics. Advising Day 12/10	Standing Waves	18-20
12/15	Completion days. 12/19 Last day classes	Exam 2	

Note: I reserve the right to adjust this syllabus during the semester

Exam 1 (09/29 & 09/30) : Motion problems in 1-D, 2-D, 3-D. Forces.

Oral (11/10 & 11/11) : Forces, Energy, and Momentum.

Exam 2 (12/15 & 12/16) : Comprehensive. Emphasis on post exam 1 material.

Grading Structure:

Weekly Homework (due on Wednesdays)	25%
Lab write-ups (always due one week after lab)	25%
Oral	15%
Exam 1	15%
Exam 2	20%

Homework — There will be homework due every Wednesday, problems from the text and some of my own problems. The assignment should be given to me or put into the box outside my office (Rose 112) by 6pm on Wednesday. I will hand homework back in class on Friday. Complete solutions will be posted. I will grade a randomly selected portion of the problems on a 0-5 scale. These scores mean roughly the following: 5=clear and complete solution, 4=good solution missing one conceptual point or calculation, 3=clear attempt but with substantive flaw, 2=effort made but incomplete plan, 1=little effort, 0=nothing appearing. I care most about the effort you invest and you can receive credit on this basis. The goal of the homework is for us to engage each other in a discussion of physics regularly, please come and visit as often as you like to discuss. Along these lines, I recommend that you work together; this is invaluable in learning physics. Please write things up yourself to show me and you that you understand it (this helps battle the illusion of explanatory depth, which is worth looking up). Someone will be doing help sessions for the course, and will give you clues on solving the problems. I will always answer any questions in class, as well. Please do not use the internet as a resource for anything but definitions of terms.

Labs — We will have lab most Mondays/Tuesdays. Your write-up is always due the Friday at the end of that week. You will keep a lab book, which I will check periodically to give you pointers on good habits and techniques.

Oral — To many people's surprise two of the most important skills of a physicist are writing and talking about physics. For the oral you will be asked to give a brief presentation about a physics topic. More details about this when the time approaches.

Exams — During the exam times (basically, all of the lab periods that week) you will pick up the exam from me, sit in the lab or nearby, and return it to me two hours later. You can bring your calculator and one sheet of paper with whatever notes or formulas you want on it, but otherwise these are closed book, closed note exams. You must not collaborate or consult with anyone else while taking the exam. I will give more specific topic lists and practice problems as we review the material before each exam.

Lateness and Other Anomalies — Anything handed in more than a week late will not be accepted. If you tell me about something ahead of time, almost any situation can be accommodated.

Course website: <http://bohr.physics.berkeley.edu/hal/teaching/phys141Fa14/>