PHYS 170: Introductory Physics I

Wheaton College, Fall 2019
Tuesdays and Thursdays, Science Center 1343

Instructors:

PHYS 170 Sections A, C:
9:00 AM – 10:50 AM
2:00 PM - 3:50 PM

PHYS 170 Section B:
11:00 AM – 12:50 PM

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All sections:
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Course Goals

This class is focused on two overarching goals:

- Expand your repertoire of problem-solving skills, hone your ability to systematically and critically analyze problems in the physical world, and learn to break down and simplify complex problems into solvable pieces.
- Build a foundation of concepts and approaches that you can use to understand the entire physical universe.

Student Objectives

By the end of this semester, you should be able to:

- Break down, analyze, categorize, and solve physical problems related to force and motion.
- Select the right tool from your problem-solving toolbox to address a problem in the simplest and most straightforward way.
- Apply abstract concepts to a hands-on situation, and analyze real-world data in the context of basic physics.

Textbook:
PHYS-170: *OpenStax - College Physics*
PHYS-180: *OpenStax - University Physics*
The textbook will be the source of readings and some homework assignments throughout the semester. It is available free as a PDF online and also it is integrated and available with the Online Sapling Learning homework.

Online Homework: Sapling Learning provides an interactive homework system which is a required component of this course. The cost for this system is $42 for the Fall semester. There may be a discount price if you want to sign up for both semesters of the Introductory Physics course.
Go to www.saplinglearning.com/login to log in or create an account.
The following link includes detailed instructions on how to register for your course: https://macmillan.force.com/macmillanlearning/s/article/Sapling-Learning-Registering-for-courses.

OnCourse: Most of the course materials will be available on the OnCourse website. We will post all course documents on this site, including syllabus, course calendar, practice tests, homework solutions, and PRS questions. You will also have access to your individual grades via this site.

Daily class structure: A number of activities will take place inside the classroom: lecture, labs, personal response questions, quizzes, and group problem solving. You should come prepared for any of these activities on any given day.

Collaboration: You will be assigned to work in groups of two, with three groups at each table. Groups will work together on lab exercises and in-class problem solving. Therefore, seating will become assigned after the first few classes.

Grading
Your grade will be figured using the following weighting scheme.

	percent	**total %**
Midterm Tests (3)	15	45
Written Homework	10	10
Sapling Homework	10	10
In-class Work	15	15
Final Exam	20	20

Midterm Tests: There will be three midterm tests during the semester. The problems will vary in difficulty but, unlike some of the problems from the text, they will always require a full understanding of the physics, so be prepared. Each test will be 15% of the final grade. In order to assist you in preparing for the exams, copies of test questions from previous exams will be available, and we will spend time reviewing and solving some of these questions.

Homework: Weekly homework will consist of some problems from the textbook, a few problems that are similar to problems that will appear on the exams, and problems from the Sapling Learning System. The goal is to give you as diverse a mixture of problems as possible, in both style and difficulty, from conceptual problems that can be solved with words, to simple mathematical and reasoning exercises, to more difficult problems that require significant planning. We strongly urge you to try to solve these problems on your own the first time around. For problems that you find difficult, we encourage you to discuss them and work them out with other students in the class. Of course you may always come see us in our offices for additional help. To do well in the course it is absolutely essential that you understand and become proficient at problem solving. To encourage you to collaborate and discuss homework freely, we have made homework only worth a small part of your grade. However, it's vital practice for the tests: we have found that students who cut corners on the homework almost always do poorly on exams.

Class Participation and Laboratory Exercises: Class participation includes in-class labs, problem solving, PRS questions, and class discussions. Most lab exercises are done in-class, and are designed to develop your conceptual understanding of the topics presented in class. Lab write-ups will be handed in during the class, unless otherwise specified. The learning process requires your dedication and involvement; it is not just the instructor lecturing to you. Your active participation in class is required, not just expected, and is worth 15% of your grade.

Final Exam: The final exam will be cumulative, and will account for 20% of your final grade. The exam will be closed-book and closed-notes, and will be three hours long.

Grading Scale

You will not be graded on a curve. Your test grades will be scaled according to the table below. This absolute scale is designed, in part, to encourage you to work together. Please help one another inside and outside of class!

Grade	+		-
A		•92	87 - 92
B	84 - 87	81 - 84	77 - 81
C	72 - 77	67 - 72	63 - 67
D	60 - 63	55 - 60	50 -55
F	< 50		

Homework Help: Physics tutoring is available in the Kollett Center. Check their schedule for times.

Policies

Missed Exams: Any exam that you miss without a legitimate excuse cannot be made up, and you will receive a zero grade.

Attendance: Notice that 15% of your grade is from work done in class. Thus, attendance is required and will be monitored. You are allowed two unexcused absences. If you must miss a class, please inform the instructor via email.

Electronic Devices in Class: Use of cell phones is forbidden in during class. Computers and tablets are allowed only for class-related activities. If you are found texting, on facebook, or otherwise engaged in a non-class related activity you will be recorded as absent for that day.

Final Exam Date: The final exam will be a self-scheduled, closed-book exam.

Homework: Homework is due on the assigned date. Assignments will be graded on a scale of 0 through 5. Late assignments will receive a grade penalty. You may miss 2 assignments in the semester. If you don't miss any, the lowest two grades will be dropped.

Athletics: College policy dictates that team practice is not a legitimate excuse for missing a class. If you foresee any regular season game conflicting with a class or a laboratory, let me know as soon as possible.

Time Commitment: Past surveys have shown that students in this course need to work for an average of six to seven hours per week outside of the classroom. This may vary significantly, so do not be surprised if you find that it takes ten hours per week to learn the material well. If even ten hours per week is not enough, then you should seek assistance by meeting us during office hours or through tutoring.

Accommodations: Wheaton is committed to ensuring equitable access to programs and services and to prohibit discrimination in the recruitment, admission, and education of students with disabilities. Individuals with disabilities requiring accommodations or information on accessibility should contact Autumn Grant - Associate Director for Accessibility Services at the Filene Center for Academic Advising and Career Services. ~ accessibility@wheatoncollege.edu or (508) 286-8215

Topic	**Tuesday**	**Thursday**	**Due Dates**
Chapter 1 Introduction and Vectors Chapter 2: Kinematics: Motion in 1 dimension	8/27 Syllabus, etc. Units, Conversion Estimation Coordinate systems Reading: 1.2, 1.4	8/29 Velocity, equations of one-dimensional motion **Motion LAB** Reading: 2.1-2.5	Chapter 1 Homework 9/5 (Short homework)
Chapter 2 Kinematics: Motion in 1 dimension Chapter 3: Vector math	9/3 NO CLASS	9/5 Acceleration, Free Fall, Kinematics **Do-it-yourself Kinematics LAB** Reading: 2.6-2.7	Chapter 2 Homework 9/10
Chapter 3 Kinematics: Motion in 2 dimensions	9/10 Scalars, Vector Addition, Vector Components **Boston Harbor Lab** Reading: 3.2, 3.3	9/12 Two-dimensional Motion Projectile Motion Relative Velocity Reading: 3.1, 3.4, 3.5	Chapter 3 Homework 9/17
Chapter 4 Newton's Laws of Motion	9/17 Newton's 3 Laws of Motion **Newton's 3rd Law LAB** Reading: 4.1-4.4	9/19 **TEST 1** Chapters 1-3	

Chapter 4 Newton's Laws of Motion Chapter 5 More Applications of Newton's Laws	9/24 **Newton's 2nd Law LAB** Normal and Tension Forces **Tension LAB** Reading: 4.5	9/26 Problem Solving Strategies Further Applications Fundamental Forces Reading: 4.6-4.8,	Chapter 4 Homework 10/1 (Long homework)
Topic	**Tuesday**	**Thursday**	**Due Dates**
Chapter 6 Uniform Circular Motion; Orbits	10/1 Further Applications Friction, springs **Friction LAB** **Springs LAB** Reading: 5.1, 5.3	10/3 Rotational Motion Angular Velocity Centripetal Acceleration Reading: 6.1, 6.2	Chapter 5 Homework 10/8 (Short homework)
Chapter 6 Kepler's Laws	10/8 Centripetal Forces Newton's Law of Gravitation Reading: 6.3, 6.5	10/10 Kepler's Laws of Orbital Motion Reading: 6.6	Chapter 6 Homework 10/17
Chapter 7 Work and Energy	10/15 **OCTOBER BREAK**	10/17 Work The Scalar (Dot) Product Kinetic Energy Reading: 7.1, 7.2	

Chapter 7 Conservative and Non-Conservative Systems	10/22 **TEST 2** Chapters 4-6	10/24 Gravitational Energy Conservative Forces and Potential Energy **Water Balloon Spring Constant** Reading: 7.3, 7.4	Chapter 7a Homework 10/29
Chapter 7 Conservative and Non-Conservative Systems	10/29 Non-Conservative Forces Conservation of Energy **Spring Energy LAB** Reading: 7.5, 7.6	10/31 Power Work, Energy, and Power in Humans **Water Balloon Lab** Reading: 7.7, 7.8	Chapter 7b Homework 11/5
Topic	**Tuesday**	**Thursday**	**Due Dates**
Chapter 8 Momentum and Collisions	11/5 Momentum Impulse Conservation of Momentum Reading: 8.1-8.3	11/7 Elastic and Inelastic Collisions **Collisions LAB** Reading: 8.4,8.5	Chapter 8 Homework 11/12
Chapter 9/10 Statics, Torque, and Rotational Kinematics	11/12 2-d collisions Center of Mass **Rocket LAB**	11/14 Static Equilibrium and Torque Reading: 9.1, 9.2, 9.4, 9.5	

Chapter 10 Rotational Energy and Momentum	11/19 Angular acceleration Rotational Kinematics Reading: 10.1-10.3 **Static torque Lab**	11/21 **TEST 3** Chapters 7-8	Chapter 9/10a Homework 11/27
	11/26 Rotational Kinetic Energy Reading: 10.4	11/28 **THANKSGIVING**	Chapter 10b Homework 12/4
Review of Motion	12/3 Angular Momentum **Rotational Energy LAB** Reading: 10.5,10.6	12/5 Final Exam Review	

FINAL EXAM: <u>Self-Scheduled</u>