

## PH100-2D: Preparatory Physics Spring 2009

This introductory course is designed to prepare students for their first college-level physics course (either PH 201 or PH 221) through development of mathematical and problem-solving skills. A major focus will be learning how to identify and apply fundamental physics principles to solving problems. Practice and feedback in problem-solving techniques are provided, with the aim to improve reading comprehension, critical thinking, and mathematical skills necessary for proficiency in future coursework. We will test and apply these skills to kinematics, vectors, force and motion, and energy. Students successfully completing this course should be able to understand how to solve physics-related word problems, including visualizing and sketching the problem, identifying relevant and solicited information, and applying kinematics to solve the problem.

**Where:** CH445      **When:** Tuesday and Thursday, 12:30 p.m. – 1:45 p.m.

**Instructor:** Andrei Stanishevsky,      Office: CH342, Lab: CH376

**Office hours:** Tuesdays, 11 a.m.- noon and 2:30 p.m. - 3:30 p.m.

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*This course is designed for students who intend to take PH 201 or 221 in the future and is not appropriate as a stand-alone course. The level is appropriate for students who have had little experience in physics, but the MA 106 prerequisite is a serious one: PH 100 is not an “easy A”.*

Prerequisite	MA106 or equivalent
<b>Tentative Schedule</b>  (Textbook: CJ: Cutnell- Johnson and HRW: Halliday- Resnick-Walker)	<p><b>Week 1 (01.08):</b> Course Introduction, Units of Measurement, Significant Figures, Math Basics (CJ Ch. 1.1 - 1.4 or HRW Ch. 1)</p> <p><b>Week 2 (01.13 and 01.15):</b> Graphing, Variables. One dimensional kinematics: Constant Velocity (CJ Ch. 2.1 - 2.5 or HRW Ch 2.1 - 2.7),</p> <p><b>Week 3 (01.20 and 01.22):</b> One dimensional kinematics: Constant Acceleration (CJ Ch. 2.1 - 2.5 or HRW Ch 2.1 - 2.7). Free fall: (CJ Ch. 2.6 – 2.8 or HRW Ch. 2.9 – 2.10).</p> <p><b>Week 4 (01.27 and 01.29):</b> <u>Test 1 on Tuesday.</u> Vectors and Trigonometry review. (CJ Ch. 1.5 – 1.9 or HRW Ch. 3)</p> <p><b>Week 5 (02.03 and 02.05):</b> Two dimensional kinematics: constant acceleration (CJ Ch. 3.1 – 3.2 or HRW Ch. 4.1 – 4.3)</p> <p><b>Week 6 (02.10 and 02.12):</b> Two dimensional kinematics: constant acceleration and projectile motion (CJ Ch. 3.3, 3.5 or HRW Ch. 4.5 – 4.6)</p> <p><b>Week 7 (02.17 and 02.19):</b> Two dimension kinematics: projectile motion; Review: Two dimensional kinematics (CJ Ch. 3.3, 3.5 or HRW Ch. 4.5 – 4.6) <u>Test #2 on Thursday.</u></p> <p><b>Week 8 (02.24 and 02.26):</b> Newton’s Laws: Mass, Force, and Equations of Motion (CJ Ch. 4.1 – 4.10 or HRW Ch. 5; 6.1 – 6.3)</p> <p><b>Week 9 (03.03 and 03.05):</b> [March 6 is the last day to withdraw from a course with “W”] Newton’s Laws: Mass, Force, and Equations of Motion (CJ Ch.4.1 – 4.10 or HRW Ch.5; 6.1 – 6.3)</p> <p><b>Week 10 (03.08 - 03.14):</b> <b>Spring Break</b></p> <p><b>Week 11 (03.17 and 03.19):</b> Newton’s Laws: Equilibrium Problems (CJ Ch.4.11 or HRW Ch6.1 – 6.3)</p> <p><b>Week 12 (03.24 and 03.26):</b> Newton’s Laws: Non-Equilibrium Problems (CJ Ch. 4.12 – 4.13 or HRW Ch. 5.9)</p> <p><b>Week 13 (03.31 and 04.02):</b> Newton’s Laws: <u>Test #3 on Tuesday.</u> Principles in Energy: (CJ Ch. 6.1 – 6.5 or HRW Ch 7.1 – 7.6)</p> <p><b>Week 14 (04.07 and 04.09):</b> Principles in Energy: work, kinetic energy, and conservation of energy (CJ Ch. 6.1 – 6.5 or HRW Ch 7.1 – 7.6, Ch 8.1 – 8.5)</p> <p><b>Week 15 (04.14 and 04.16):</b> Principles in Energy: work, kinetic energy, and conservation of energy (CJ Ch. 6.1 – 6.5 or HRW Ch 7.1 – 7.6, Ch 8.1 – 8.5, 8.7-8.8)</p> <p><b>Week 16 (04.21 and 04.23):</b> <u>Test #4 on Tuesday.</u> Course Overview.</p> <p><b>Final exam: Tuesday, May 5, 2009 in CH445 from 10:45 a.m to 1:15 p.m.</b></p>

<b>Grading</b>	<p>Homework (4) - 30%, Tests (4) - 40%, Quizzes - 10%, Final exam (Tuesday, December 9, 10:45 a.m. - 1:15 p.m. in CH445) - 20%.</p> <p>Grade “A” is given if 90% (and above) of all assignments is completed successfully; “B”= 80 - 89.5%, “C”=70 - 79.5 %, “D”=60 - 69.5%, “F”=0 - 59.5%. The decimals are rounded to the nearest 0.5 %. The point system is employed – 100% = 1000 points.</p> <p><b>Homework</b> (30% or 300 points total, 75 points each) will be given through WebAssign at <a href="https://www.webassign.net/uab/login.html">https://www.webassign.net/uab/login.html</a></p> <p>You must use this link only, and you will need your Blazer ID and password to login. The homework for specific topics covered in class is due at least one class before the exam on those topics. The homework problems will be reviewed in class after the homework due date. There may be extra problems (maximum 50 points) added to the homework given on WebAssign that can be used for an extra credit.</p> <p>You will have at least one week to complete the homework, and no time extension or make up homework will be given.</p> <p><b>Tests</b> (40%) will evaluate the student’s progress in class, understanding of the discussed material, and practice problem solving. There will be four major tests (10% or 100 points each). The time allocated for each test is one class period and no extra time will be given because extra time is already included. Tests are open notes test. The notes should be put on both sides of a single sheet of paper (A4 format, or 8½”x11”), and you are responsible for the preparing your notes. Some critical notes will be provided by instructor. Tests should be stapled in the upper left corner (if more than one page). <u>The detailed solution of each problem should be given, not the answers only. The answers should be clearly marked.</u></p> <p><b>Quizzes</b> (total 10% or 100 points, 2 quizzes planned, each ~ 30 min) will be given either in class or using WebAssign. Start and due dates for quizzes will be announced, and they will be given before the tests on corresponding topics.</p> <p>The make-ups for missed in class tests and quizzes can only be given if the reasons for the absence in class are serious and properly documented. Students must notify me about the expected absence before the test/quiz date (or right after the class with test/quiz in an emergency case). The make-up assignment should be completed within one week after the original one during my office hours.</p> <p><b>Final Exam</b> (20% or 200 points) includes solving a comprehensive set of problems on the topics covered in class. The goal of final exam is to test your understanding of fundamental concepts and ability to apply them on practice.  <u><b>The final exam will be given on Tuesday, May 5, 2009 in CH445 from 10:45 a.m to 1:15 p.m.</b></u></p>
<b>Textbook</b>	<p>Halliday-Resnick-Walker, <i>Fundamentals of Physics</i>, 8<sup>th</sup> edition, if you plan to take Physics 221 (PH 221)</p> <p>Cutnell &amp; Johnson, <i>Physics</i>, 7<sup>th</sup> Edition, if you plan to take Physics 201 (PH 201)</p>
<b>Attendance</b>	<p>Class attendance is strongly encouraged and it is mandatory for the tests. Each student is responsible for any material covered in class as well as for being informed of any change in this schedule.</p>

**Course Learning Objectives:**

By successfully completing this course a student should be able to:

1. Demonstrate proficiency in using a scientific calculator for physics computations.
2. Readily apply algebraic, trigonometric and graphing techniques to physics problems.
3. Learn to use the language of physics, both in thinking and on paper: (a) Translate “word problems” to physics language; (b) Draw diagrams appropriate to the task or problem; (c) Translate diagrams to equations, using principles and laws of physics; (d) Solve and calculate; (e) Check magnitudes, units and reasonableness; (f) Conceptually explain the result.
4. Avoid the “formula” (rote-learning) approach to problem solving; embrace the “principle” approach.

5. Memorize, be able to explain in words and apply in equation form, the basic laws of physics in the first 6 - 8 chapters of Cutnell & Johnson (Halliday, Resnick & Walker); to be identified in class.
6. Carry out a decision making process: identify a problem type and decide which basic physics law(s) apply(ies).
7. Be precise and make needed approximations when approaching physics problems.
8. Use vector-component techniques appropriately in physics calculations.
9. Apply problem-solving skills to areas listed in Course Description.
10. Conceptually, quantitatively and verbally explain and defend the solution to a problem using the language of physics.
11. Demonstrate on in-class work, tests, and final exam that one understands the problem and its solution, not that one simply has somehow managed to write down the correct number as an answer.
12. Demonstrate proficiency at using online homework resources in a manner that encourages, not avoids, one's use of the manual, visual, audio and abstract/conceptual learning tools described above.
13. Maintain an ongoing, quantitative measure of one's progress and learning in physics.

**Notes:**

- You may receive e-mails from me with PH100-2D in the subject line. These e-mails contain important information and/or updates to the class schedule. Please, be sure to read these e-mails.
- Read the corresponding book chapter (or required part of the chapter) before the class. The syllabus will guide your reading, but keep track of whether the class is proceeding ahead or behind schedule.
- Use my office hours! If you have a problem with the topics covered in class, please come and see me. It can save you a lot of trouble later on if you get help early. You will need everything discussed early on in the class to understand the material covered in later chapters, so don't hesitate to ask questions.
- It turns to be very helpful when students in this course organize small study groups. You should consider it as early as possible.
- A pocket nonprogrammable calculator which has scientific (powers of 10) notation, trigonometric functions, log and exp can be used during quizzes, tests, and final exam.
- Remember to provide the detailed solution of each assigned problem, not the answers only. It may save you the points in a case if your answer is incorrect due to an accidental error.
- The make-ups for missed tests and quizzes can only be given if the reasons for the absence in class are serious and properly documented. Students must notify me about the expected absence before the test/quiz date (or right after the class with test/quiz in an emergency case).

**Problem-Solving Techniques:**

- Read the problem, then read it again. Failure to read the problem is perhaps the source of more false starts and wrong answers than is any other cause.
- Draw a sketch or diagram of the problem that will help you to visualize the situation presented by the problem.
- Write down the given and known quantities.
- Make sure you understand which quantities are to be found.
- There are generally only a few principles applicable to the solution of a problem. Think about which principles link the quantities to be determined to those that are known.
- Use the principles that apply to the situation to guide you to the equation or equations that contain the quantities in the problem. Pay attention to when certain equations apply and when they do not. The rest is mathematics! Sometimes, several of the equations need to be manipulated together. Count the number of equations available to see if there are enough equations to determine the unknowns.
- When you solve for an unknown in terms of known quantities, use symbols, not numbers. Wait until the end to put in numbers and units. It is important to include units, both because the answer may require them and because the proper cancellation of units will provide a check.
- When you get a number, think about it. Does it make sense? If you find that it takes 3 minutes to drive from New York City to Los Angeles, you have probably made a mistake!
- Use any checks you can find for your result.