# Physics 171
# Introductory Physics: Mechanics and Relativity
# Spring 2011 — Professor Abazajian

Updated January 23, 2011

**Course topics:** Kinematics, Newton's laws, energy and work, special relativity, rotational kinematics, angular momentum, gravity, fluids, and gases. This course is designed for physics majors and those desiring a rigorous preparation in the physical sciences. Knowledge of basic calculus will be assumed.

**Prerequisites:** Math 140 (Calculus I) and a high school physics class, or permission of the department.

**Lectures:** Mondays, Tuesdays, Thursdays, and Fridays from 10:00–10:50, in room 1204 of the Physics Building. See the Course Schedule for the planned topic(s) for each lecture. The schedule may shift around by a day or so if some topics take more or less time than expected.

**Required textbook:** "Physics for Scientists and Engineers" by Tipler and Mosca, sixth edition, volume 1, published by W. H. Freeman and Company as an E-Book, available online via WebAssign for $25. Instructions for using WebAssign and ELMS will be given in class. Students can purchase a printed version (optional) for an extra $25 through the e-Book site. With the e-book, you should subscribe to the DynamicBook Set number 13492905 in order to see my edits and comments in the e-book. You do not need to bring the book to class. Most lectures are associated with 1 to 4 sections from the book as indicated on the Course Schedule, and ***you should read those prior to the lecture***.

**Homework** will be assigned about once per week and must be turned in at the beginning of class on the specified date (or earlier). Don't wait until the last day to get started! Please do all of the homework and turn it in on time, unless you have a valid excuse (i.e. illness, a religious observance, or some other compelling reason). If you do not have a valid excuse, you can still turn in the homework up to 24 hours late for half credit; after that, no credit will be given. As an exception to the 24-hour cutoff, if the homework was due on a Friday, then it will be accepted in class on the following Monday for half credit. (Homework due on Tuesday will be accepted late only up to Wednesday morning, not Thursday.)

If you are unable to finish the complete homework assignment on time, then you may turn in a partial set of answers on time for full credit, and then turn in the remaining answers late for half credit. However, this practice is discouraged since it complicates the grading and bookkeeping. If you must turn in additional answers late, please write "Additional answers – turned in late" at the top of your page to help us keep things straight.

**Exams:** There will be three **exams** during the semester plus a final exam. The exams will be given in class, on paper, and will be closed-book. Any needed physical constants or data will be provided. You will need a calculator with standard trigonometry functions, etc. Exams must be taken on the scheduled days unless you have a valid excuse. If you know in advance that you will have to miss an exam, please inform me as soon as possible.

**Up-to-date course information and your scores on assignments** will be available on the ELMS (Blackboard) system. If you go to http://elms.umd.edu and log in with your username (which is your campus "Directory ID") and password, you should see the course listed in the "My Courses" panel.

**Course grade:**

| | |
|---|---|
| 40% | Homework |
| 12% | Each exam during the semester |
| 24% | Final exam |

**How to do well in this course:**
Do your readings *before* the lecture on the material. Come to the lectures. Do all the homework. Ask for help (your professor, TA, or a classmate) whenever there is something you don't understand. *Utilize office hours!* The professor and TA are here to help with the material, not make it harder. Review your notes and past homework assignments before each exam.

**Contact Information:**
Prof. Kevork Abazajian, 4101 Physics Building, 301-405-6009, kev@umd.edu
Usual office hours: Mondays 2:00–3:00pm and Wednesdays 2:00-3:00pm in room 4101
TA/Grader: TBA, undergraduate TA

*** NOTE: Office hours are subject to change – watch for announcements

If you are unable to come during regular office hours, please contact us by email or phone to ask a question and/or arrange a time to meet.

**Honor Code:**
The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit http://www.studenthonorcouncil.umd.edu/whatis.html.

**Students with disabilities:**
Accommodations will be provided to enable students with disabilities to participate fully in the course. Please discuss any needs with your instructor at the beginning of the semester so that appropriate arrangements can be made.

**Weather and emergency closures:**
If the University is closed due to weather or some emergency situation on a day when homework is due, then that homework must be turned in at the beginning of the next class when the University is open. If the University is closed on the scheduled date of an exam, then the exam will be given during the next class period when the University is open. If the University is closed on any non-exam day, including a review session (the class immediately before an exam), then the exam will still be given according to the original schedule. In these or other exceptional circumstances, we will attempt to communicate with students by email.

**Course Evaluations:**
Your participation in the evaluation of courses through CourseEvalUM is a responsibility you hold as a student member of our academic community. (www.courseevalum.umd.edu) Your feedback is confidential and important to the improvement of teaching and learning at the University as well as to the tenure and promotion process. CourseEvalUM will be open for you to complete your evaluations for spring semester courses at the end of the semester. Follow announcements for when the evaluations are open.. By completing all of your evaluations each semester, you will have the privilege of accessing online, at Testudo, the evaluation reports for the thousands of courses for which 70% or more students submitted their evaluations.

**Final Exam:**
**Date & Time To Be Announced**

# Physics 171 Course Schedule

## Spring 2011 — Professor Abazajian

| | Date | Lecture topic(s) | Reading assignment |
|---|---|---|---|
| Mon | 24-Jan | Course intro; Measurement and units | 1-1 to 1-5 |
| Tue | 25-Jan | Vectors and coordinate systems | 1-6, 1-7 |
| Thu | 27-Jan | Motion in one dimension, acceleration | 2-1, 2-2, 2-3, 2-4 |
| Fri | 28-Jan | Peer Instruction | |
| Mon | 31-Jan | Motion in two and three dimensions | 3-1, 3-2 |
| Tue | 1-Feb | Circular motion | 3-3 |
| Thu | 3-Feb | Peer Instruction; Newton's 1st & 2nd laws | 4-1, 4-2, 4-3 |
| Fri | 4-Feb | Forces | 4-4, 4-5 |
| Mon | 7-Feb | Force Problems | 4-6 |
| Tue | 8-Feb | Newton's 3rd law | 4-7, 4-8 |
| Thu | 10-Feb | Force Problems; Peer Instruction | |
| Fri | 11-Feb | Friction and drag | 5-1, 5-2 |
| Mon | 14-Feb | Solving problems with curved paths | 5-3 |
| Tue | 15-Feb | Time-varying forces, Center of Mass | 5-4, 5-5 |
| Thu | 17-Feb | Review | |
| Fri | 18-Feb | **Exam 1** | |
| Mon | 21-Feb | Peer Instruction; Energy and work | 6-1, 6-2 |
| Tue | 22-Feb | Dot products, work, and power | 6-3, 6-4 |
| Thu | 24-Feb | Potential energy; Conservation of energy | 7-1 |
| Fri | 25-Feb | Peer Instruction; Conservation of energy | 7-2, 7-3 |
| Mon | 28-Feb | Quantization of energy; Many Bodies | 7-1, 8-1, 8-2 |
| Tue | 1-Mar | Solving problems with collisions | 8-3 |
| Thu | 3-Mar | Reference frames | 8-4 |
| Fri | 4-Mar | Peer Instruction; Relativity | R-1 to R-4 |
| Mon | 7-Mar | Relativity of Simultaneity tutorial | R-5 |
| Tue | 8-Mar | Relativistic momentum, energy, and particles | R-6 |
| Thu | 10-Mar | Peer Instruction; Review | |
| Fri | 11-Mar | **Exam 2** | |
| Mon | 14-Mar | Rotational kinematics | 9-1, 9-2 |
| Tue | 15-Mar | Moment of inertia | 9-3, 9-4 |
| Thu | 17-Mar | Solving problems with torque and rotation | 9-5 |
| Fri | 18-Mar | Peer Instruction; Torque | 9-6 |
| | **Spring Break: March 21-25** | | |
| Mon | 28-Mar | The vector nature of rotation | 10-1 |
| Tue | 29-Mar | Angular momentum and torque | 10-2 |
| Thu | 31-Mar | Gyroscopes & Angular Momentum | 10-2 |

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|---|---|---|---|
| Fri | 1-Apr | Gyroscopes & Angular Momentum | 10-3 |
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| Mon | 4-Apr | Peer Instruction; Conservation of **L** | 10-4 |
| Tue | 5-Apr | Static equilibrium | 12-1 to 12-4 |
| Thu | 7-Apr | Elasticity | 12-7 |
| Fri | 8-Apr | Peer Instruction | |
| | | | |
| Mon | 11-Apr | Kepler's Laws and Orbital Mechanics | 11-1, 11-2 |
| Tue | 12-Apr | Gravitational force and potential energy | 11-2, 11-3 |
| Thu | 14-Apr | Review | |
| Fri | 15-Apr | **Exam 3** | |
| | | | |
| Mon | 18-Apr | Peer Instruction; Gravitational fields and tides | 11-4 |
| Tue | 19-Apr | Exam 3 solutions | |
| Thu | 21-Apr | Density and pressure in fluids | 13-1, 13-2 |
| Fri | 22-Apr | Buoyancy | 13-3 |
| | | | |
| Mon | 25-Apr | Fluids in motion | 13-4 |
| Tue | 26-Apr | Peer Instruction; Simple Harmonic Motion | 14-1, 14-2 |
| Thu | 28-Apr | Pendulums | 14-3 |
| Fri | 29-Apr | Damped, driven oscillations | 14-4 |
| | | | |
| Mon | 2-May | Peer Instruction; Temperature | 17-1 |
| Tue | 3-May | Thermometers and refrigerators | 17-2 |
| Thu | 5-May | The ideal gas law | 17-3 |
| Fri | 6-May | The kinetic theory of gases | 17-4 |
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| Mon | 9-May | Review – first half of the course | |
| Tue | 10-May | Review – rest of the course | |

**Final exam** **TBA**