# PHYS 111 01
# Basic Physics I
# Dr. Eric C. Anderson
# UMBC • Spring • 2017
# Syllabus

## • Getting ready •

**Prerequisites •** High school mathematics, including trigonometry, or MATH 150.

**Workload •** Experience shows that success requires at least 8-10 hours per week of intensive effort outside of class - more for those lacking strong preparation and study techniques. Be sure that you can dedicate the time and concentration required for success.

**The book and other required items •** *College Physics*: *A Strategic Approach* by Knight, Jones, and Field, 3rd ed., and *Mastering Physics* (MP) access. RF LCD Clicker + Turning Account. Scientific calculator.

**Blackboard (BB) •** Access between classes for course materials, discussion forums, your grades, helpful advice, and announcements.

**Registering your clicker •** See Blackboard/Syllabus folder.

**Registering for MP •** Go to http://www.masteringphysics.com/ and click *Register Now, Students*, and give your access code (inside your MP package.) The course ID is MPANDERSON77720. If you registered for MP before, login with your username and password.

**Class •** Lecture MWF 10-10:50 AM in LH1 101. Check your schedule for your weekly laboratory section time in PHYS 108.

## • Goals and methods •

Basic Physics I is intended for those majoring in the life sciences and others for whom basic knowledge of physics is helpful or desired. Phys 111 addresses the following General Education program and course learning goals:

**General education program (GEP) goals**: *This course addresses the GEP's functional competency* Scientific and Quantitative Reasoning. *It has been approved to meet the GEP* Sciences *distribution requirement.*

1. Understand and use mathematical and scientific methods of inquiry, reasoning, processes, and strategies to investigate and solve problems.

In particular, by the end of the course you should be able to *qualitatively* reason about physical processes, using (1) verbal statements of physical principles, (2) representations such as free-body diagrams, and (3) equations: For example, determine how a change in one physical quantity affects another physical quantity, determine how two quantities compare, etc. "Qualitative" means no exact number, just "qualities" like bigger/smaller, increasing/decreasing, positive/negative, direction, etc.

You should also be able to *quantitatively* reason with physical principles and functional relationships (i.e., proportional, linear, quadratic, and inverse): Sketch a graph of a given functional relationship. Given a graph, be able to identify the corresponding functional relationship. Describe what each quantity in a quantitative relationship represents. Solve for and determine an unknown. Use proportional reasoning to determine the factor by which a quantity changes, given a change in another quantity. "Quantitative" refers to "quantities", i.e, numbers.

2. Organize, interpret, draw inferences, and make predictions about natural or behavioral phenomena using mathematical and scientific models and theories.

In particular, by the end of the course you should be able to effectively carry out a systematic approach to solve *multi-step* problems (e.g., a motion problem featuring two different constant accelerations during different time intervals, an energy problem requiring ideas from the equilibrium and elasticity unit to first determine a spring constant, etc.) and *novel* problems (i.e; you've studied and/or solved similar problems, but the (1) quantity to be determined, (2) context, or (3) combination of principles required for the solution is different.) An example: In lab you solved an equilibrium problem on the force that the bicep exerts to lift a dumbell, with the simplifying feature that there are only right angles. In class we solved an equilibrium problem on the force that the back muscle exerts to lift a box, with the complexity of non-right angles. On an exam, you should be prepared to solve, for example, an equilibrium problem relating to the force that the bicep exerts to lift a dumbbell, with non-right angles.

A systematic problem solving approach involves three steps:

*Prepare*: Translate a verbal problem into physics terms by creating appropriate representations (e.g., motion diagrams, free-body diagrams, assigning symbols to given and unknown quantities).

*Solve:* Begin quantitative solution by identifying an appropriate physics principle and quantitative relationship from provided *quantitative relationships* sheet.

*Assess*: Check your result by checking units, judging whether your result seems reasonable, and exploring alternate paths to a solution.

3. Recognize that mathematical, statistical, and scientific evidence requires evaluation.

**Course goals**: By the end of the course you should be able to:

1. Qualitatively and quantitatively reason with definitions of distance, displacement, speed, velocity, and acceleration.

2. Create and interpret graphs of position vs. time, velocity vs. time, and acceleration vs. time.

3. Solve problems related to one-dimensional and two-dimensional motion.

4. Identify forces and draw free-body diagrams, calculate components and vector sums of forces.

5. Apply Newton's laws of motion to solve problems involving conservative and non-conservative forces and motion.

6. Apply equilibrium conditions to extended objects to determine unknown forces and torques.

7. Apply conservation of energy to solve problems involving energy transfers and transformations for a system.

8. Apply the first law of thermodynamics and the ideal gas law to solve problems relating to thermal processes for ideal gases.

9. Apply properties of fluid pressure and Archimedes' principle to solve problems relating to buoyancy.

**Blackboard (BB)•** Log on to myUMBC, click the *Blackboard* tab and then click *PHYS 111 Basic Physics I* in the *My Courses* area for access to course materials, discussion forums, your grades, helpful advice, and announcements. Log in at least once between classes.

**Reading assignments and reading quizzes•** To prepare you to actively engage in class, textbook sections that you should read before class are given in the day-by-day guide, later in the syllabus. Reading quizzes (RQs) consist of about 10 questions (i.e.,multiple-choice, T/F, numerical) delivered online, through BB, usually due before each Monday class (9:50 AM).

**Class•** Classes focus on deepening your understanding of the more difficult concepts from the reading and on developing scientific reasoning and systematic problem solving skills. Find the outline the night before each class on BB under *Course Documents*. Print it out or access on your tablet and annotate. Bring your clicker to each class. Your participation grade is based on the number of days in which you responded to clicker questions.

**Mastering Physics (MP)•** MP assignments are designed to build conceptual understanding, develop scientific reasoning skills, and provide practice and feedback with systematic problem solving. Keep a careful written record of your work for future studying. Complete MP assignments online, usually due each Wednesday at midnight.

**Laboratory•** Many of the main concepts of the course will be reinforced in weekly laboratory sessions, through direct experience with the physical world. Your grade for each lab is based on a prelab that's due at the beginning of the session (1 pt), full attendance and participation in the session as well as performance on selected items each lab (1 pt), and lab homework due at the beginning of the next session (3 pts). *Lab homework will only be accepted if you complete the related lab*. You must attend the session that you're officially registered for. You'll demonstrate mathematical modeling skills developed in labs and lab HW via a 10 pt individual exam using lab computers (17-20 Oct).

**Quizzes and exams•** Given most Fridays, quizzes provide practice and feedback for exam preparation. For exams, expect problems, conceptual tasks requiring you to explain your reasoning, and multiple-choice items. Laboratory activities and homework, reading, lecture, and MP will help you acquire the understanding and skills you'll need. All needed quantitative relationships will be provided (see BB/*Course Documents*). Calculators are permitted. *Class exams given at 8 AM, in multiple lecture halls; check BB for your assigned lecture hall and seat.*

**Final exam•** Comprehensive, with some extra weight to content that follows the last class exam. Similar format to individual class exams.

## • Policies •

**Grading •** 5% (20 pts) for reading quizzes, 15% (60 pts) for lab, 5% (20 pts) for HW, 5% (20 pts) for best 8 of 9 class quizzes, 45% (180 pts) for 4 exams, 5% for participation (20 pts), 20% (80 pts) for final exam. 360 pts (out of 400 possible, i.e., 90%) required for A, 320 pts (80%) for B, 280 pts (70%) for C, and 240 pts (60%) for D.

**Reclaiming and reviewing work •** Exams, quizzes, and lab homeworks are returned to you in lab. Lab homework solutions are posted each Friday at 5 PM in the glass case across from the Physics Tutorial Center (Physics 226). Exam solutions are posted on BB/ *Course Documents* at 5 PM after each class exam. Review graded work right away, and check that we enter your grades in BB correctly. *Notify us of any grading mistakes within a week*: Contact your lab TA about lab grading mistakes. Get exams to me directly, or through the Physics Department office (Physics 221), along with a note describing the mistake. (For errors in assigning partial credit, make sure that you've examined the posted solutions, and that your note explicitly addresses the discrepancy.)

**Making up work •** If you must miss an exam due to officially-sanctioned UMBC activities, illness, family emergency, detention by authorities, or another difficulty, contact me as soon as possible. At my discretion, I'll request written verification of the cause of your absence and arrange a makeup exam over the same material. The final exam must be taken at the scheduled time. If you must miss a lab, you may submit the homework from the *previous lab* to me directly or through the Physics Department office before 5 PM Friday of the week of your missed lab. You may attend your usual lab section during the makeup week (1-2 May) and submit the related homework to me directly or through the Physics Department office before 5 PM 5 May. For MP, it's better late than never: Possible credit for each item drops steadily to 50% after 48 hours and stays there until 16 May. Start early on reading quizzes, no late reading quizzes are possible. No makeup class quizzes either; we drop your lowest to allow for illness and other difficulties. Your participation grade allows 5 free days, to account for absences and clicker malfunctions; no individual accommodations are possible. Those who will represent UMBC in officially sanctioned university activities should speak with me as soon as possible to address possible conflicts.

**Academic integrity •** All instances of academic misconduct will be addressed according to the UMBC Policy on Academic Integrity (http://www.umbc.edu/integrity/students.html). Examples include attempting to make use of disallowed materials on exams, attempting to communicate with anyone other than the instructor or TA during an exam, altering graded work and submitting it for regrading, asking someone else to take an exam in your place, copying or paraphrasing another's work on homework, asking someone else to do homework and representing it as your own, and permitting or assisting another student to carry out any of the above. Penalties range from a grade of 0 on a homework or exam to an F in the course (at my discretion), and from denotation of academic misconduct on the transcript to expulsion (as determined by official hearing of the Academic Conduct Committee.)

**Courtesy •** Electronic devices in class only to assist with learning physics please (e.g., viewing/annotating class materials, researching)

## • Getting help •

**Contact me •** Eric C. Anderson, Physics 320. Office hours M 12:00-12:50, W 2:00-2:50, Th 12:30-1:50 through 16 May. (Check BB for updates.) Phone 455-5823, email andersoe@umbc.edu. Please email me through BB or use your UMBC email and give your full name and your class. *If you seek HW help or have a general course question, please post to the appropriate discussion forum on Blackboard, so that others might benefit*.

**Form or join a study group •** Perhaps with the help of the *Forming study groups* forum on Blackboard.

**Attend PASS** (**Peer Assisted Study Sessions**) **•** A PASS leader guides students through study sessions. Students review the material with a PASS leader who has excelled in this course, and attends the course with the students in order to make sure the material being reviewed is accurate and current. PASS is great for reinforcing and solidifying concepts, and PASS leaders also conduct exam reviews. Watch BB announcements for times.

**Troll the discussion board •** Post a question to a forum on Blackboard, or post an answer to another's question.

**Attend the help sessions (HS) •** Offered before each class exam (see day-by-day guide below).

**Visit the LRC Math Lab •** The Math Lab offers walk in help for students in Phys 111 every Monday from 12-1 PM and 2-3 PM; ideal for students who just have a few questions about a certain concept. It can also be used as a quick prep before a test. The Math Lab is located on the first floor of the Library.

**Sign up for LRC Appointment Tutoring •** Sign up for weekly, small group tutoring with a certified peer tutor. This is recommended for students who could benefit from consistent support in the course. You can sign up for weekly appointment tutoring here, or you can click the sign up button on their Facebook page.

# • Day-by-day guide •

| Week of: | Monday | Lab | Wednesday | Friday |
|---|---|---|---|---|
| 30 Jan-3 Feb | Introduction to the course | Lab 1 Introduction to motion | **RQ (Ch 1 and syllabus) due**<br>Ch 1 Representing motion<br>**MP 0 due (ungraded)** | Ch 1 Representing motion |
| 6-10 Feb | **RQ (Ch 2) due**<br>Ch 2 Motion in one dimension | Lab 2 Changing motion | Ch 2 Motion in one dimension<br>**MP 1 due (Ch 1)** | Ch 2 Motion in one dimension<br>**Quiz 1 (Ch 1)** |
| 13-17 Feb | **RQ (Ch 4) due**<br>Ch 4 Forces and Newton's laws | Lab 3 Creating mathematical models of motion | Ch 4 Forces and Newton's laws<br>Help session 12-12:50 Eng 027<br>**MP 2 due (Ch 2)** | **Exam 1 (Ch 1-2)** |
| 20-24 Feb | **RQ (Ch 5.1-4) due**<br>Ch 5 Applying Newton's laws | Lab 4 Force and motion | Ch 5 Applying Newton's laws<br>**MP 3 due (Ch 4)** | Ch 5 Applying Newton's laws<br>**Quiz 2 (Ch 4)** |
| 27 Feb-3 Mar | **RQ (Ch 5.5-6) due**<br>Ch 5 Applying Newton's laws | Lab 5 Force, mass, and acceleration | Ch 5 Applying Newton's laws<br>**MP 4 due (Ch 5.1-4)** | Ch 5 Applying Newton's laws<br>**Quiz 3 (Ch 5.1-4)** |
| 6-10 Mar | **RQ (Ch 6) due**<br>Ch 6 Circular motion, orbits, and gravity | Lab 6 Gravitational forces | Ch 6 Circular motion, orbits, and gravity<br>**MP 5 due (Ch 5.5-6)** | Ch 6 Circular motion, orbits, and gravity<br>**Quiz 4 (Ch 5.5-6)** |
| 13-17 Mar | **RQ (Ch 8.3-4) due**<br>Ch 8 Springs and elasticity | Lab 7 Elasticity | Ch 8 Springs and elasticity<br>Help session 12-12:50, Eng 027<br>**MP 6 due (Ch 6)** | **Exam 2 (Ch 4-6)** |
| 20-24 Mar | | | | |

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| 27-31 Mar | **RQ (Ch 7.3-4; 8.1) due**<br>Ch 7-8 Torque and equilibrium | Lab 8 Torque and equilibrium | Ch 7-8 Torque and equilibrium<br>**MP 7 due (Ch 8.3-4)** | Ch 7-8 Torque and equilibrium<br>**Quiz 5 (Ch 8.3-4)** |
| 3-7 Apr | **RQ (Ch 10.1-6) due**<br>Ch 10 Energy and work | Lab 9 Conservation of energy | Ch 10 Energy and work<br>**MP 8 due (Ch 7.3-4; 8.1)** | Ch 10 Energy and work<br>**Quiz 6 (Ch 7.3-4; 8.1)** |
| 10-14 Apr | **RQ (Ch 10.8, 11.1-2) due**<br>Ch 10-11 Metabolic energy and power | **Lab exam** on mathematical modeling | Ch 10-11 Metabolic energy and power<br>**MP 9 due (Ch 10.1-6)** | Ch 10-11 Metabolic energy and power<br>**Quiz 7 (Ch 10.1-6)** |
| 17-21 Apr | **RQ (Ch 14.1-4) due**<br>Ch 14 Oscillations and energy | Lab 10 Oscillations tutorial | Ch 14 Oscillations and energy<br>Help session 12-12:50, Eng 027<br>**MP 10 due (Ch 10.8, 11.1-2)** | **Exam 3 (Ch 7-8, 10-11)** |
| 24-28 Apr | **RQ (Ch 11.3-4; 12.1-3) due**<br>Ch 11-12 Ideal gases and thermal processes | Lab 11 Thermal processes turtorial | Ch 11-12 Ideal gases and thermal processes<br>**MP 11 due (Ch 14.1-4)** | Ch 11-12 Ideal gases and thermal processes<br>**Quiz 8 (Ch 14.1-4)** |
| 1-5 May | **RQ (Ch 12.5-7) due**<br>Ch 12 Specific heat and calorimetry | Makeup labs | Ch 12 Specific heat and calorimetry<br>**MP 12 due (Ch 11.3-4; 12.1-3)** | Ch 12 Specific heat and calorimetry<br>**Quiz 9 (Ch 11.3-4; 12.1-3)** |
| 8-12 May | **RQ (13.1-4) due**<br>Ch 13 Fluids | No meetings | Ch 13 Fluids<br>Help session 12-12:50, Eng 027<br>**MP 13 due (Ch 12.5-7)** | **Exam 4 (Ch 11-12, 14)** |
| 15-19 May | Ch 13 Fluids<br>**MP 14 due (Ch 13.1-4)** | No meetings | | **Final exam (Comprehensive, with extra weight given to fluid statics.) 1030 AM - 1230 PM Mon 22 May, locations TBA** |