General Physics I, PHYS-UA 11 | Fall 2016 | Skirball Theatre
Tuesday, Thursday | | 9:30 – 10:45 a.m.
Dr. Andre Adler | Department of Physics | Office: Meyer Hall, Room 252

Course Description

This course is a serious introduction to physics for students who have high school algebra, geometry, and trigonometry at their fingertips, and have had, or are taking calculus. Calculus will be used in class but sparingly on exams. The algebra, geometry, and trig are absolutely essential. If some time has elapsed since your last math course, or you feel a lack of confidence in this area, you are strongly urged to study math intensively before we get too deeply into the physics course. Topics include kinematics and dynamics of particles; momentum, work, and energy; gravitation; circular, angular, and harmonic motion.

Required Materials

A custom package of three eLearning tools: *MasteringPhysics*, *Perusall*, *Learning Catalytics*; includes the e-text of *University Physics*, 14th edition, by Young and Freedman. Purchase at the NYU Bookstore or by going to the website of the NYU Bookstore.

Laboratory Experiment Descriptions can be found by going to http://physics.nyu.edu/~physlab/Lab_Main/ and clicking on General Physics II.

Electronic Learning Resources

We will use three cloud-based learning resources: MasteringPhysics (MP), Perusall and Learning Catalytics (LC). On MP you will find the, typically, weekly homework to do outside of the lecture hall. Perusall transforms the text to a place you can read, and engage fellow students in understanding and overcome inevitable confusion that accompanies learning. Finally, LC is the system we will use for you to work with your fellow students on problems in the lecture hall.

MasteringPhysics is a homework and tutorial system, providing feedback to your answers, and extensive hints for many problems. Most of the problems you will see on MP are conceptual, requiring input in a variety of forms to accommodate the type of problem, whether it be a ranking, sorting, graphing, vector-drawing, symbolic or numeric. Typically, you will have one assignment per week.

Perusall is where you can prepare for each class by reading the assigned material. But it also extends the reading assignment by providing a mechanism for you to annotate the text with questions and comments. You can start a new thread by making a comment or asking a question, or contribute to a pre-existing thread, with answers to questions, new questions or comments. Doing the reading is an important component of preparing for the class participation you will engage in during lectures.

Learning Catalytics is a tool to manage work in and out of the classroom. It provides a way to deliver problems to work on, collaboratively, during class, while providing real-time compilation of results. Every class will include problems for you to work on with your neighbors. It also provides a way for you to send me questions during class. You must bring a laptop, tablet or smartphone to participate in class.

One reason for using Perusall is that it can help you prepare for lecture. The better prepared for lecture you are, the smaller the chance that you will find you did not have sufficient time to work on Learning Catalytics problems in class.

All assignments on MasteringPhysics, Perusall and Learning Catalytics are computer-graded.

Exam Schedule, Assessment Weightings and Letter Grade

There will be examinations, three during the semester and one cumulative final examination. The four exams will be based on the homework, readings, and lectures. All examinations are in multiple-choice format. Both quantitative and conceptual questions will appear on the examinations, as this reflects the content of the course. A formula sheet will be provided with the exam. You will need to bring a calculator to all exams. Sharing calculators with other students during examinations is not allowed. You may not use a cell-phone, or any other communication device, during the exams.

Assessment	**Percentage**	**# Dropped**
Perusall assignments	5%	4 Lowest
Learning Catalytics assignments	10%	4 Lowest
MasteringPhysics assignments	10%	Lowest
Lab	20%	Lowest
Exam 1 – September 30	10%	
Exam 2 – October 28	10%	No Exams Dropped
Exam 3 – December 2	10%	
Final Exam (Cumulative) – December 19	25%	

Exam Replacement Policy The grade on the final exam will replace your lowest in-class midterm exam provided that your final exam score is higher (on a percentage basis). In other words, your lowest midterm score will become equal to your final exam score provided that your final is higher.

Your total numerical score, calculated from the components listed above, correspond to the following letter grades:

If your total percent score is at least:	90	86	82	72	68	64	54	45	40	Below 40
then you will receive a grade no lower than:	A	A-	B+	B	B-	C+	C	C-	D	F

The cutoffs for each letter grade *might* be lowered but they will not be raised.

Missed Exam Policy If you are excused from exams 1, 2 or 3, due to a documented medical or other reason, the other two exams and the final exam will count for more, and a letter grade assigned at the end of the semester. An incomplete will not be assigned. If you are ill and cannot appear, you must produce verifiable documentation from a physician, with physician's letterhead, that explaining that you were too ill to attend the examination. Students who are absent from a test during the semester without an excuse will receive a grade of zero on that test.

Missed Final Exam Policy If you miss the final exam and you provide acceptable documentation, your grade will be an incomplete (I). You are then required to take the final examination the next time the course is given. In this case, that is during the second summer session, usually a date in mid-August. If you cannot make that date, then the next opportunity to take the make-up exam is in June 2017.

If you miss an exam due to medical reasons, give your medical documentation to me in person. Please do not send it to me via email.

Laboratory Sessions

You will attend laboratory weekly; laboratory sessions will be held in Rooms 222/223 of Meyer Hall. The schedule of labs is on the last page. The laboratory grade will be based on an average over all labs, but the lowest lab grade will be dropped before the average is calculated. Any lab missed without a doctor's note or prior arrangement with the instructor counts as a zero. There are no make-up sessions for missed laboratories. You may not attend a laboratory that you are not registered for.

It is important to bring a calculator and your laboratory experiment description to the laboratory sessions. Your laboratory instructor will provide more information regarding the policy for handing in lab reports.

If you miss more than two lab experiments or fail to hand in more than two reports, your grade for the course will be and F or an I (assuming that you are passing the other components of the course and that you provide medical documentation to explain your absence). To make up the lab requirement, you will have to complete the entire set of labs, not just the ones you missed. This can be done in the following summer session or in the next academic year, space permitting.

MasteringPhysics

Access homework by going to www.pearsonmylabandmastering.com. The mastering course ID for the Fall 2016 semester of General Physics II is posted to the General Physics I NYU Classes home page. You will not be able to access homework without this course ID.

Important: When you register for Mastering,

1. *enter your netID when you are prompted to enter a Student ID and*
2. *enter your NYU email address.*

Your first assignment is called "Introduction to MasteringPhysics." While it will not contribute to your grade, it is strongly recommended that you complete this assignment. Doing so may prevent you from losing credit on homework assignments. You should familiarize yourself with the grading policy as it pertains to homework.

Learning Catalytics

After you arrive in the classroom, log onto www.pearsonmylabandmastering.com and click on the Learning Catalytics button. Once completed, you can join the running session for that morning's class.

Annotating in Perusall

Perusall helps you master readings faster, understand the material better, and get more out of your classes. To achieve this goal, you will be collaboratively annotating the textbook with others in your class. The help you'll get and provide your classmates (even if you don't know anyone personally) will get you past confusions quickly, and will make the process more fun. While you read, you'll receive rapid answers to your questions, help others resolve their questions (which also helps you learn), and advise the instructor how to make class time most productive. You can start a new annotation thread in *Perusall* by highlighting text, asking a question, or posting a comment; you can also add a reply or comment to an existing thread. Each thread is like a chat with one or more members of your class. Your **goals** in annotating each reading assignment are *to stimulate discussion by posting good questions or comments* and *to help others by answering their questions*.

Research shows that by annotating thoughtfully, you'll learn more and get better grades; so here's what "annotating thoughtfully" means: Effective annotations *deeply engage points in the readings, stimulate discussion, offer informative questions or comments, and help others by addressing their questions or confusions*. To this end your annotations are evaluated on the basis of **quality, timeliness**, **quantity,** and **distribution**:

Quality The reading replaces the lectures so that you can engage in more useful activities in class. Therefore it is important that you read the text thoughtfully and attempt to lay the foundation for the work in class. Each of your annotations is assigned one of the following evaluations:

2 = Demonstrates thorough and thoughtful reading AND insightful interpretation of the reading
1 = Demonstrates reading, but no (or only superficial) interpretation of the reading
0 = Does not demonstrate any thoughtful reading or interpretation
See the examples on the next page to see the quality criterion applied to sample annotations.

Quantity We compute your overall score using your 7 highest-quality annotations for each assignment, so be sure to write at least this number to ensure the best score. Because we want you to engage in a natural conversation with your classmates through your annotations, your overall score only depends only on these 7 highest-quality annotations. So, as long as you have 7 high-quality annotations, a brief response to another student (*e.g.*, answering "Yes" to what is just a yes or no question) **won't hurt your overall score**, even though by itself that response is nominally a "0."

Timeliness The work done in class depends on you having done the reading in advance, so completing the reading and posting your annotations before the posted deadline is required to receive credit. You have a two-day late annotation period during which the credit for your annotations linearly decreases from 100% at the deadline to 0% at the end of the late annotation period.

To encourage discourse, there is always a 12-hour reply window after each posted deadline during which you can continue to reply, for full credit, to questions posted by others. However, the number of additional points you can earn during the post-deadline reply window is capped at the credit you receive for annotations made on that assignment before the deadline.

Distribution To lay the foundation for understanding the in-class activities, you must at least familiarize yourself with each assignment *in its entirety*. Annotating only part of the text and/or failing to distribute your annotations throughout the document lowers your overall score.

Overall Evaluation: You will receive an overall evaluation for each reading assignment based on the criteria above as follows: 3 = exceptional (rarely given), 2 = meets expectations, 1 = needs improvement, 0 = insufficient

Optional Help

1. *Free physics review sessions by upper-level undergraduate physics majors* in the Meyer Building, Room 421. The sessions run Monday through Friday, at many different times during the day. Sessions begin the second week of class and a schedule will be posted the week of September 5. The physics majors will be able to help you with the course concepts, readings and problems. This is a great place to go for help. You can go to as many sessions as you wish. Ideally, you should go on a weekly basis.
physics.as.nyu.edu/object/physics.ug.tutoring

2. *Free peer tutoring, Study Slams, group reviews, workshops, and more!!*

University Learning Center
www.nyu.edu/ulc
ULC@Academic Resource Center, 18 Washington Place, Lower Level
ULC@UHall, 110 East 14th Street, top of stairs by UHall Commons
Achieve Excellence!

Perusall Scoring Examples

CONCEPTS

In the preceding two chapters, we developed a mathematical framework for describing motion along a straight line. In this chapter, we continue our study of motion by investigating inertia, a property of objects that affects their motion. The experiments we carry out in studying inertia lead us to discover one of the most fundamental laws in physics—conservation of momentum.

4.1 Friction

Picture a block of wood sitting motionless on a smooth wooden surface. If you give the block a shove, it slides some distance but eventually comes to rest. Depending on the smoothness of the block and the smoothness of the wooden surface, this stopping may happen sooner or it may happen later. If the two surfaces in contact are very smooth and slippery, the block slides for a longer time interval than if the surfaces are rough or sticky. This you know from everyday experience: A hockey puck slides easily on ice but not on a rough road.

Figure 4.1 shows how the velocity of a wooden block decreases on three different surfaces. The slowing down is due to *friction*—the resistance to motion that one surface or object encounters when moving over another. Notice that, during the interval covered by the velocity-versus-time graph, the velocity decrease as the block slides over ice is hardly observable. The block slides easily over ice because there is very little friction between the two surfaces. The effect of friction is to bring two objects to rest with respect to each other—in this case the wooden block and the surface it is sliding on. The less friction there is, the longer it takes for the block to come to rest.

Figure 4.1 Velocity-versus-time graph for a wooden block sliding on three different surfaces. The rougher the surface, the more quickly the velocity decreases.

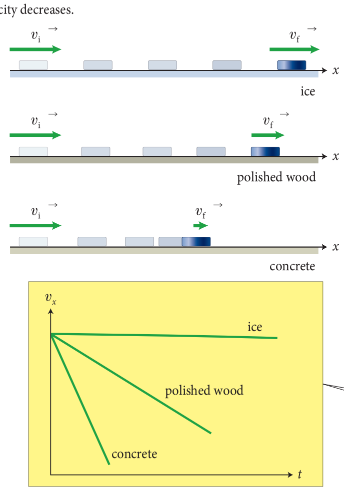

Figure 4.2 Low-friction track and carts used in the experiments described in this chapter.

You may wonder whether it is possible to make surfaces that have no friction at all, such that an object, once given a shove, continues to glide forever. There is no totally frictionless surface over which objects slide forever, but there are ways to minimize friction. You can, for instance, float an object on a cushion of air. This is most easily accomplished with a low-friction track—a track whose surface is dotted with little holes through which pressurized air blows. The air serves as a cushion on which a conveniently shaped object can float, with friction between the object and the track all but eliminated. Alternatively, one can use wheeled carts with low-friction bearings on an ordinary track. Figure 4.2 shows low-friction carts you may have encountered in your lab or class. Although there is still some friction both for low-friction tracks and for the track shown in Figure 4.2, this friction is so small that it can be ignored during an experiment. For example, if the track in Figure 4.2 is horizontal, carts move along its length without slowing down appreciably. In other words:

In the absence of friction, objects moving along a horizontal track keep moving without slowing down.

Another advantage of using such carts is that the track constrains the motion to being along a straight line. We can then use a high-speed camera to record the cart's position at various instants, and from that information determine its speed and acceleration.

4.1 (*a*) Are the accelerations of the motions shown in Figure 4.1 constant? (*b*) For which surface is the acceleration largest in magnitude?

4.2 Inertia

We can discover one of the most fundamental principles of physics by studying how the velocities of two low-friction carts change when the carts collide. Let's first see what happens with two identical carts. We call these *standard carts* because we'll use them as a standard against which to compare the motion of other carts. First we put one standard cart on the low-friction track and make sure it doesn't move. Next we place the second cart on the track some distance from the first one and give the second cart a shove toward the first. The two carts collide, and the collision alters the velocities of both.

ANNOTATION	EVALUATION	
Alan: I remember, in high school, being amazed at how quickly carts could travel on these tracks - air would blow up through these tiny holes evenly distributed along the length of the track and the cart would essentially float on the air and consequently - the cart would move very quickly with the slightest push.	No substance. Does not demonstrate any thoughtful interpretation of the text.	0
Bob: Although there is no way to create frictionless surfaces, I find it interesting that we consider experiments "in the absence of friction." In a way, this relates back to Chapter 1.5 where we talked about the importance of having too little or too much information in our representations. In some cases, the friction is so insignificant that we ignore it (simplifying our representation).	Annotation interprets the text and demonstrates understanding of concepts through analogy and synthesis of multiple concepts.	2
Claire: Does this only apply to solid surfaces? I feel as if a substance that floats on water either has negligible or very little friction.	Possibly insightful question but does not elaborate on thought process, nor demonstrate thoughtful reading of the text.	1
Alan: Why is this? I don't get it.	Question does not explicitly identify point of confusion nor demonstrates thoughtful reading or interpretation of the text.	0
David: believe this applies to almost every surface, although I'm not sure if water would count more as resistance than friction. Anyways, the best example I could think of would be a surf board. If people who were paddling in the same direction as the waves experienced no resistance, they would continually speed up, and eventually reach very high speeds. However, in reality if they were two stop paddling they'd slow down and only the waves would slowly push them to shore.	Response demonstrates a thoughtful explanation with a claim substantiated with a concrete example	2
Alan: Is it possible to have a surface, in real life, that inflicts NO friction at all?	Question exhibits superficial reading, but does not exhibit any interpretation of the textbook.	1
Erica: Doesn't air resistance factor into this at all? It seems that it is not enough for there to be only an absense of friction for something to keep moving without slowing down. What about some other opposing force - like air resistance? Or is air resistance just another example of friction?	Demonstrates thoughtful interpretation of the text by refuting a statement through a counter example.	2
Bob: The key word is "appreciably". In the absense of friction, the cart does not slow down appreciably but still would a little due to air resistance	Responds to the question by thoughtfully interpreting the text	2
Alan: a) yes b) concrete has the acceleration of greatest magnitude	Annotation not backed up by any reasoning or theoretical assumptions. No evidence of thoughtful reading of text.	0
Erica: I would think that they are not constant because if we think of the formula F=ma, the force of friction is different in every case so that would change the acceleration value (where mass would stay the same since it's assumed that th object is the same in each situation).	Response backed up with reasoning that demonstrates an interpretation of the text and applies understanding of concepts	2
Claire: As a theoretical question about inertia, if an object in motion will stay in motion, but is being affected by friction, will it slow down perpetually but remain in motion, or will it eventually stop completely due to the friction? Just curious.	Profound question that goes beyond the material covered in the textbook.	2
Alan: With friction everything slows down to a half at one point or another. It is only if an outside force acts on the object if that object will maintain motion after the effects of inertia.	Demonstrates some thought but does not really address Claire's question	1
Claire: Standard carts: identical carts in mass, shape, etc. I like this notion of standard carts, it provides a good baseline to compare other motion and to understand the concepts before building on it.	No substance. Does not demonstrate any thoughtful reading.	0
Alan: Great visual representation of friction! It is interesting how this compares the velocity of things on different surfaces	No substance. Does not demonstrate any thoughtful reading.	0
Bob: The rougher the surface, the more friction between the surface and the wooden block, and thus acceleration will be greater.	Interprets the graph and applies understanding of both the concept of friction, how a v-t graph corrponds to acceleration and the relationship between the force of friction and acceleration	2

General Physics I Syllabus

Date	*Lecture Topic*	*Ch.*	*Weekly Laboratory*
T Sep 6	Vectors	1	No Labs (all week)
R Sep 8	Motion Along a Straight Line (omit 2.6)	2	
T Sep 13	Motion Along a Straight Line (omit 2.6)	2	Motion 1 (9/12 – 9/15)
R Sep 15	Motion in Two or Three Dimensions (omit 3.5)	3	
T Sep 20	Motion in Two or Three Dimensions (omit 3.5)	3	Motion 2 (9/19 – 9/22)
R Sep 22	Newton's Laws of Motion	4	
T Sep 27	Newton's Laws of Motion	4	Equilibrium of a Particle (9/26 – 9/29)
R Sep 29	Applying Newton's Laws	5	
T Oct 4	Applying Newton's Laws	5	Newton's Second Law (10/3 – 10/6)
R Oct 6	Work and Kinetic Energy	6	
T Oct 11	Work and Kinetic Energy	6	No Labs (all week)
R Oct 13	Potential Energy and Energy Conservation	7	
T Oct 18	Potential Energy and Energy Conservation	7	Centripetal Force (10/17 – 10/20)
R Oct 20	Momentum, Impulse and Collisions (omit 8.6)	8	
T Oct 25	Momentum, Impulse and Collisions (omit 8.6)	8	Conservation of Energy (10/24 – 10/27)
R Oct 27	Rotation of Rigid Bodies (omit 9.5, 9.6)	9	
T Nov 1	Rotation of Rigid Bodies (omit 9.5, 9.6)	9	Collisions in One Dimension (10/31 – 11/3)
R Nov 3	Dynamics of Rotational Motion (omit 10.7)	10	
T Nov 8	Dynamics of Rotational Motion (omit 10.7)	10	Ballistic Pendulum (11/7 – 11/10)
R Nov 10	Periodic Motion (omit 14.6, 14.7, 14.8)	14	
T Nov 15	Periodic Motion (omit 14.6, 14.7, 14.8)	14	Work-Energy (11/14 – 11/17)
R Nov 17	Mechanical Waves	15	
T Nov 22	Mechanical Waves	15	No Labs (all week)
R Nov 24	No Class		
T Nov 29	Sound and Hearing (omit 16.6, 16.7, 16.8, 16.9)	16	Oscillations of a String (11/28 – 12/1)
R Dec 1	Sound and Hearing (omit 16.6, 16.7, 16.8, 16.9)	16	
T Dec 6	Fluid Mechanics (omit 12.6)	12	Resonance Tube (12/5 – 12/8)
R Dec 8	Fluid Mechanics (omit 12.6)	12	
T Dec 13	No General Physics I Class Classes Meet on Monday Schedule		
R Dec 15	Gravitation (omit 13.4, 13.5, 13.6, 13.7, 13.8)	13	