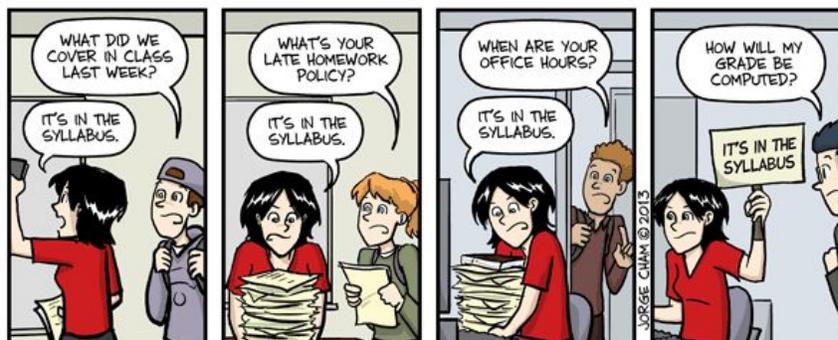


# Physics 131

## Introduction to Physics I

Spring 2017  
Dr. Toggerson



# IT'S IN THE SYLLABUS

This message brought to you by every instructor that ever lived.

WWW.PHDCOMICS.COM

*"Piled Higher and Deeper" by Jorge Cham. www.phdcomics.com*

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OFFICE HOURS: TBA, but see section on office hours below

**CLASS SESSIONS:** We meet Monday, Wednesday, and Friday. The time at which we meet is the same for all three days and specified by your section and given below. Note, I teach all of these sections. Thus, if you email or try to meet me at these times, I am unavailable. This is a team-based learning class and you will be beholden to your team-members in your section. As such, you may not attend a different section! On SPIRES, Monday and Wednesday are listed as "lecture" and Friday is listed as "Lab." In reality all three sessions will be essentially the same – we had to do this to make SPIRE work. More on lab in the corresponding section below.

Section	Time
PHYS 131-05	2:40 – 3:55

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## About the course

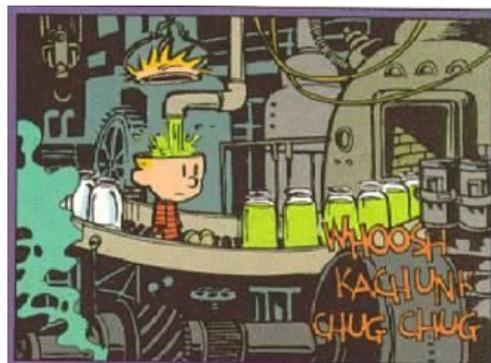
Physics 131 is the first semester in a two-semester course on introductory physics. No calculus is required for this course. However, we will assume some familiarity with algebra, and basic trigonometry. To see a full list of what we are going to learn, look at the “What are we going to learn in this class?” document available on Moodle.

## The Team-Based-Learning (TBL) format of this course

Think about a previous math or physics class you have taken. I will bet it followed the format: content and simple example problems presented in lecture with more difficult problems done on your own for homework. In fact, most of my teaching evaluation comments are along the lines of, “I wish we did more examples in class.” The idea of this TBL course is that you can be exposed to content and simple examples on your own. Then, in class where you will have the support of your classmates and instructors, you will work more challenging problems. Thus, essentially all of class time is spent working in teams to learn how to *apply* the ideas you learned on your own.

### Why TBL?

There are many scholarly articles which clearly indicate that learning is an active process – I cannot just put information in your heads as in this *Calvin and Hobbes* comic. Lecture is an inherently passive process. In a lecture, we sit, listen, and take notes. If you are anything like me, the main benefit of lecture is really the notes. I know that when I take a lecture-based class, most of my learning comes from doing the problems and making study materials while using my notes as a guide. The research supports this experience. I want you to be in the classroom with me and my staff when you are working on this part of the learning experience. If you would like to see some of the literature on this, a list of some of the works which have provided the theoretical basis for this class is provided on Moodle.



### Ok, so learning is active, but why the *team* part of TBL?

Again, the reason you will be working in teams is based in research. Research indicates that learning is, in addition to being inherently active, is also an inherently social activity. We have all been in the rut where we can't figure something out, but as soon as we bounce ideas off

someone else, we get it. That experience is a manifestation of the social aspect of learning: being forced to articulate your ideas clearly and bouncing ideas off of others improves learning and problems solving skills. In addition, the vast majority of you are interested in the science or health fields. In these fields, the lone-genius working by themselves, an archetype which is so prevalent in our culture, no longer exists (if they ever did)! To work in the science and health fields, you need to be able to work with others on scientifically challenging tasks. I am speaking from experience on this issue, the picture below shows a *small fraction* of the 3000-person collaboration of which I was a part as a Ph.D. student.



I do recognize, however, that many of you may have had a bad experience with teamwork in a class in the past. To that end, the mottoes of this class are

- 1) *You are beholden to your team, not to me, for your team performance.*
- 2) *Your team cannot hurt you, your team can only help you, but your team cannot save you!*

# How teams in this course will be structured

## How big are the teams and how long will they stay together?

On the second day of class, you will be organized into teams of **five**. These teams will be heterogeneous in many dimensions and will be constructed using the CATME software. **You will stay in the same teams for the entire semester.**

## Will team performance be evaluated? (Or “How do the team’s points get distributed?” or “What if one of my teammates is a slacker?”)

Team activities will be graded, and that grade will be applied to everyone in the team, regardless of who is present. However, to make up for teammates who may not be pulling their weight, there will be a peer-evaluation system using the CATME software at the end of the semester. In this process you will evaluate the performance of your fellow teammates.

The evaluations will result in a multiplier for each team-member. The purpose of this multiplier is to take into account different levels of effort. If everyone pulls an equal share of the weight, then everyone’s team multiplier will be 1. If one team-member pulls *more* than their fair share then their team multiplier may go as high as 1.05; such values are rare, however. Someone who is not pulling their weight, may have a multiplier as low as 0.4. This multiplier gets multiplied to all team scores: laboratory, team quizzes, and team exams. For example, say your team has a team quiz average of 90%. If you have a multiplier of 1, then a 90% is what will figure into your grade. If your multiplier is say 0.4, then the team quiz average for your grade is  $0.4 \times 90\% = 36\%$ . Thus, being a good team member is important in this class!

## What if I am absent?

As stated in team motto #1, you are not beholden to me for your team performance, you are beholden to your teammates. You need to let your *team* (not me!) know when you are going to be absent and why. You and your team will have an opportunity in-class to discuss what constitutes reasonable absences, and your team is responsible for taking attendance. This attendance roster will **not** figure directly into your grade but will serve as a reference document for doing evaluations. If you are absent, I recommend finding a way to make it up to your team by taking on some other responsibility.

# Units

This course will be organized into five units:

- I. Mathematical Tools and Foundational Concepts
- II. Newton's Laws and Forces
- III. Forces and...
- IV. Energy
- V. Entropy

Each unit will last between two and three weeks and begin on a Monday. **The exact dates for the beginning of each unit can be seen on the Moodle calendar.** For complete details of what we will learn in each unit, please refer to the "What are we going to learn in this class?" document on Moodle.

## *Before the first day of the unit:*

You will be responsible for completing a set of preparatory activities to ensure that you are ready to begin exploring the finer points of the ideas and applying them in class. This preparation includes both readings and some simple problems to help you check that you sufficiently understand the readings for class. **This preparation is meant to help you learn and provide practice on the material before you come to class.** This is perhaps one of the biggest differences between this environment and a typical lecture-based course: the homework is due before the unit begins! If you think of a typical math/science homework assignment, there are easy problems at the beginning and harder ones at the end. This homework will only be those easy problems. **We are NOT expecting you to gain a complete mastery of all of the material – only a proficiency with the basic ideas.** The preparation will culminate in a short (~10 question) multiple choice quiz on the first day of the unit. Since the homework is designed to get you ready for class, **late homework will NOT be accepted.**

The hub for all homework will be the MasteringPhysics homework system, and its structure is based upon feedback from students last semester. When you log into MasteringPhysics, you will see a window like the one shown at the top of the next page. You can see that the homework is divided into sections. At the top of each section is a "question" for "practice" which contains the reading assignment we would like you to complete and videos we would like you to watch as a checklist. This form is to help you make sure that you get everything! After the readings, there are problems associated with the readings - if you are stuck on a question, please refer to the readings at the top of that section. **You will typically have two and a-half weeks to complete an assignment, and the assignments are written with this in mind. In past semesters, each homework set took students on average two to three hours to complete, i.e. I expect you to do about one-hour per week.**

MasteringPhysics: Unit 1 - ...

https://session.masteringphysics.com/myct/assignment?assig

UMass PHYS 131 Fall 2016

Signed in as Brokk Toggerson, Instructor

Unit 1 - Mathematical Tools and Found...

**Unit 1 - Mathematical Tools and Foundational Concepts Prep**  
 Due: 8:00am on Monday, September 12, 2016  
 You will receive no credit for items you complete after the assignment is due. Grading Policy

**A Message from Your Instructor:**  
 Total video time: 1 hour, 37 minutes Total sections to read: 9

**A Message from Your Instructor:**  
 Introduction and Units

[Overview of Unit 1](#) is for practice  
 Incomplete

**A Message from Your Instructor:**  
 Basic Data Analysis Tools and My Policy on Significant Figures

[Understanding Data Readings](#) is for practice  
 Incomplete

[Calculating Mean and Standard Deviation](#) is for 1 point(s)  
 Incomplete

**A Message from Your Instructor:**  
 Position and Velocity

[Position and Velocity Readings](#) is for practice  
 Complete | Your score: **100%**

[Problem 1.7](#) is for 1 point(s)  
 Incomplete

[Problem 1.8](#) is for 1 point(s)  
 Incomplete

[Problem 1.13](#) is for 1 point(s)  
 Incomplete

[Problem 1.25](#) is for 1 point(s)  
 Incomplete

**A Message from Your Instructor:**  
 Acceleration

[Acceleration Readings](#) is for practice  
 Incomplete

[Problem 2.24](#) is for 1 point(s)  
 Incomplete

[Motion with constant acceleration 1](#) is for 1 point(s)  
 Incomplete

## The readings

The reading checklist within MasteringPhysics will have links to videos to watch as well as readings to complete within the *Perusall* system. **The due date for readings will be the day of the quiz at 8:00am. However, we will review the most common questions/concerns from the reading on the day before the quiz.** Thus, it is in your best interests to have at least completed a significant amount of the reading by this date.

Most of the readings will be within the *Perusall* system, which, in addition to being linked from MasteringPhysics is also linked directly from Moodle. Inside of *Perusall* you will see a window similar to the one shown below. On the right, you see the assignments for Unit 2 which include two readings from UMD and several sections from the OpenStax textbook. Each section is a separate assignment. For each assignment, you are expected to leave annotations: either questions, comments, or responses to the comments of your peers. These annotations are graded on a 0-1-2 scale. You may leave as many annotations in an assignment as you like, but only the top TWO on each assignment are graded - for a total maximum of FOUR points per

assignment. The number of points that you are trying to get on a given set of assignments will vary from unit to unit based upon the number of pages there are to read. The number of points needed for a perfect score will be listed with the total number of readings and total video time at the top of the MasteringPhysics assignment for that unit.

## The problems

Below the readings in each section are a selection of problems within the MasteringPhysics system. For the homework problems, you will have 6 attempts to answer each question. For most questions, you will not lose any points for needing multiple attempts. For multiple choice questions however, you will lose  $1/(n-1)$  points for each attempt (to prevent people from just guessing to get the correct answer!). **Don't wait until you are almost out of attempts to get help! Give a problem 2 or 3 serious tries and then get some help from me, a TA, or one of your colleagues!** Some questions have "Hints." If you manage to complete the problem without using the Hint, then you will get a 2% bonus! Some hints have questions buried in them. These in-Hint questions can be used to regain some points that you may have lost by using multiple attempts. Be aware, however, that not all problems will have Hints.

**Given that the purpose of the preparation assignments is to ensure that you are ready for class, no extensions on homework will be given – you will be given the assignments with plenty of lead time to complete them. I recommend you start early and come to office hours if you have questions! You are permitted (and in fact encouraged!) to work with other students on these assignments. Again, I encourage you to come to office hours to get help!**

## On the first day of the unit: Quiz

The first day of each unit will be for a quiz to check your preparation. Quizzes are about 10 multiple choice questions and are closed book and notes. However, equation sheets will be provided. These equation sheets will be on Moodle in advance. After you have turned in your quiz, you will then work with your team to complete the same quiz. Your total quiz grade for each unit will be the average of your individual and team quiz scores. After these are complete (they will be graded the same day) we will, as a class, have a discussion on the most difficult points. The quiz questions will directly come from the list of objectives listed at the top of each list of readings within MasteringPhysics.

**If you are absent on the day of the quiz:** On the NEXT day of class, you should show up to a P131 section that is not your own to take the quiz. You need not come at the start of class. We will set you up in one of the little side rooms. If you take the quiz as makeup, then you forfeit the benefit of your team - your individual quiz score will count for your team score as well. Note, that for most everyone, the team scores are much higher than their individual scores. I recommend that you reserve the quiz dates (listed above and on the Moodle calendar now).

## On the rest of the days of the unit: Application through problems and Laboratory

For the rest of the days we will be working on activities to help you learn to apply the ideas that you were exposed to before the unit began. Most of these activities will be done in your teams, but some will be individual. These activities will include:

- Solving problems similar to what would be the hard problems on the homework for the unit
- Laboratory-type activities to help you connect physics to the real world and better understand data
- Constructing definitions for ideas and concept maps to help you see the big picture
- Evaluating and critiquing other teams' work. In addition to a great exercise in of itself, this will also provide you clarity on how exams will be graded.

Note, there are no challenging homework problems for you to complete for a grade on your own. If you want additional practice on more challenging problems, there will be sets of additional practice problems available on MasteringPhysics. These problems will not be graded.

They are only there for you. These sets make a great way for you to test if you have a mastery of the material without your team!

## Laboratory

While the Friday session on SPIRES is indicated as “Lab,” in this class, the laboratory activities will be integrated with the regular classroom sessions. This means that we will, at times, use Friday for a standard class meeting, and Mondays or Wednesdays for labs. Labs will be conducted when they best fit with the material. More on lab assignments can be found below. There will be **around eight** labs total over the course of the semester. Labs will be turned into Moodle with your team. **LATE LABS WILL NOT BE ACCEPTED.** However **THE LOWEST LAB WILL BE DROPPED.** Everyone on the team will receive the same score. However, to deal with people’s concern for “freeloaders” all lab grades will be multiplied by the peer evaluation multiplier at the end of the semester.

## In-class behavior

During class, I expect you to be participating with your team in the activity we are engaged in that day. Therefore, if I see you on Facebook etc. or doing work for another class, I will ask you to leave. In a lecture class, I don’t really care what you do as you are only hurting yourself in that situation. In this environment, however, you are bringing down your entire team.

## Exams

### What is the point of the exams?

This is a question you may not have thought of before! Here are my goals for the exams:

- To check your grasp of the basics of the fundamental relationships in physics
- To see if you can APPLY the fundamental ideas we have learned *in-class* to NEW situations. The homework is a starting point for class - not the basis for the exams.
- To see what you do NOT know so I can try to correct the errors

In order to achieve these goals, the exams have two main attributes. **First, the exams will be problems you have not seen before.** I want you to be able to use the ideas and reason as a physicist – not just memorize solutions to problems you have seen. More details on the exams will come as we get closer to the first one.

## How many exams will there be and what will they cover?

There will be two midterm exams and one final. **All exams are cumulative, but will focus on the most recent material!** Thus, the final is really just the same as another exam. The first exam will cover units I and II. The second midterm will cover through unit IV and the final will, of course, cover all of the material. A practice exam will be provided for each exam so that you can see the format before the actual exam. Each exam will have both an individual portion and a team portion.

## What do we get to bring to each exam?

The exams are closed-book and closed-note. You will be permitted to bring calculator. In alignment of my goal that exams should be more about application than memorization, an equation sheet will be provided for you. You will **NOT** be able to bring your own equation sheet. However, the equation sheet will be provided well in advance. I recommend that you use it to solve problems in class so that you can become familiar with it. The equation sheet will only have physics-related equations and data (fundamental constants etc.) on it. As budding scientists, there are certain mathematical relationships, such as the volume of a sphere, which we do expect you to have memorized. A list of these relationships is provided on Moodle.

## Structure of the exams

**The exams will be 6 October, 17 November, and 21 December (the last is during the finals period). All exams will be from 6:00pm - 8:40pm.** The first 1.5 hours (6:00pm - 7:30pm) will be the individual portion of the exam. Afterwards, there will be 10 minute break at which point you will form up into your teams and have one hour to complete the *same* exam.

## How does the individual portion of the exam work?

I want this course to be as accommodating to as possible and allowing the maximum number of students to have the same class experience. As such, exams will be written to take about 45 minutes and *everyone* will be given double time (1.5hrs total) to complete them thereby removing any need for extended time accommodations less-than or equal-to factors of two. Of course, arrangements for other accommodations such as reduced distraction environments, will be provided for those students who arrange for them through disability services. The exam will be a mix of multiple choice and long answer. For the multiple choice portion, you will be presented with several problems and asked to solve a subset of your choosing.

## Team exams

For the team portion of the exam, you will be working in your teams to complete the same exam. In the team portion, however, you must answer *all* of the questions.

## How should I prepare for the exams?

This is something that we will spend a bit of time on in-class. However, if you find yourself memorizing a lot of formulae, or trying to memorize the solutions to “ramp problems” and “pulley problems” then you are probably going about it the wrong way. If you have questions, I encourage you to come to my office hours and we can discuss ways for you one-on-one. As with the quizzes, the ideas of the questions are already available as listed objectives for the course. For the exams, look in the *What are we going to learn in this class?* document on Moodle.

## What do I need for this course?

### Textbook

To keep your costs down, we will be using the OpenStax physics textbook as the basis for this course. This book is already loaded into *Perusall*. Most of the readings will be from this book. It is available at <https://openstaxcollege.org/textbooks/college-physics> in many formats. A paper copy is available in the library as well. If you would like your own paper copy, you may order one from that same link. Any other readings will be provided in *Perusall*. There may be additional readings in other places from other sources. These links will be provided to you when needed.

### ABCD Voting card

In an additional effort to save you money, we will not be using clickers in this class. Instead, we will be using a piece of paper. One will be handed out to you on the first day of class. If you need a new one, a pdf is available on Moodle and you can print out a new one. **Please do not make your own.** The color scheme on these cards is chosen carefully so that I can read them from across the room. It is often difficult for me to read cards that students make.

## MasteringPhysics Account

This is how I will organize the readings and other delivery materials. In addition, this is where the before-unit homework will be completed. As stated above, there will also be optional additional problems in this system. To sign up for an account, go to

[http://www.pearsoncustom.com/ma/umass\\_physics/](http://www.pearsoncustom.com/ma/umass_physics/). You only need the \$35.00

MasteringPhysics account, you do NOT need the additional eText, but are free to purchase it if you desire. Instructions on how to sign up for MasteringPhysics are available in a document on Moodle that will become available when you finish the quiz on this syllabus.

## Calculator

Not only will you need it for exams, but for in-class materials as well!

## Optional: A camera

Access to a camera (such as on your phone) may be helpful. You will often be working as a team on the whiteboards and being able to take a picture of your work to review and annotate later may be useful. There are many good apps for taking pictures of whiteboards such as OfficeLens by Microsoft.

## How is my grade computed?

If you have not read the section on the elements of the course above, please do first. This section will not make much sense otherwise!

## How much is each component worth?

<b>Individual components (65% total)</b>		<b>Team components (35% of total)</b>	
Online Homework (5% Perusall 5% MasteringPhysics problems)	10%	Laboratory and other in-class activities	10%
Individual quizzes	10%	team quizzes	10%
	(50% of total RAT score)		(50% of total RAT score)
Individual Exam I	15%	Team Exam I	5%
	(75% of total exam score)		(25% of total exam score)
Individual Exam II	15%	Team Exam II	5%
Individual Exam III	15%	Team Exam III	5%

Remember, your team score will be multiplied by a factor based upon your peer-evaluation at the end of the semester!

A spreadsheet tool to help you calculate your grade is available on Moodle.

**In addition, there will be a total of 3% of bonus to your final grade available for completing certain activities throughout the semester.**

## What is the grading scale?

	A	≥ 89%	A-	≥ 84%	
B+	≥ 81%	B	≥ 78%	B-	≥ 73%
C+	≥ 69%	C	≥ 65%	C-	≥ 60%
D+	≥ 55%	D	≥ 50%	F	< 50%

An 89% is guaranteed to be an A. I reserve the right (but not the responsibility) to lower this scale if needed. Such a curve is collaboration friendly (this is a *team-based* learning class after all!). I am not looking for a specific number of A's. If everyone gets above an 89%, then everyone in the class will get an A. If everyone has an 89, then everyone will get an A. **Helping and working with your fellow students will NOT hurt your grade in ANY WAY.**

## What do I need to do to get an A?

This scale is developed on the assumption that an A student will have the following averages

Individual components		Team components (Multiplier of 1)	
Online Homework	100%	In-class activities	95%
Individual Quizzes	90%	Team Quizzes	95%
Individual Exam I	80%	Team Exam I	88%
Individual Exam II	80%	Team Exam II	88%
Individual Exam III	80%	Team Exam III	88%

## Questions about grading

While grading so many problems and exams mistakes do of course happen. However, as a rule the number of mistakes in your favor usually balances the number of mistakes against you. If you would like a regrade please bring the assignment to me WITHIN ONE WEEK of the date that the assignment is returned and I will regrade the ENTIRE assignment. It is possible that you can end up with a lower score. Requests for regrades at the end of the semester will not be considered.

## Office hours and Consultation Room

There is a P131 consultation room in Hasbrouck 110. This room will be open Tuesdays and Thursdays from 10am - 7pm. During this time, the room will be staffed by TAs or instructors for this course. Feel free to drop-in any time for help. **I encourage you to come to office hours with questions on preparatory readings, before-unit online homework, studying tips, and anything else! Don't wait to come in!** In addition, I will have some office hours in my office. These hours will be posted on Moodle shortly after the beginning of the semester.

## Cheating

While this is a team-based learning class, there are individual portions, in particular the individual quizzes and exams. I should not even have to say this, but cheating will not be tolerated on these individual activities. If you are caught cheating on an exam, the minimum consequence is that you will fail the class. Furthermore it is my responsibility to report you to the Dean of Students. Also, all students are expected to abide by the student policies at [https://www.umass.edu/dean\\_students/campus-policies](https://www.umass.edu/dean_students/campus-policies)

## Final thoughts

I want you to be successful in this course, however for a significant portion of this class you are responsible for your own learning. Each person learns differently, if your current habits are not yielding the results you want, please come and see me. I know quite a few techniques that I have used as well as techniques used by my colleagues in undergraduate and graduate school. We can work together to find study techniques that work for you.

It is the University's goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please let me know immediately so that we can discuss options. You are also welcome to contact Disability Services (413-545-0892) to establish reasonable accommodations. Please be aware that the accessible table and chairs in this room should remain available for students who find that standard classroom seating is not usable.

## My door is always open!