Noon

PHYS-2050† (17) Mechanics and Heat (CRN:20619-Kaldon)  
Western Michigan University

Dr. Philip Edward Kaldon                Summer I 2006  
2203 Everett Tower                Version 17.05  
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http://homepages.wmich.edu/~kaldon/  
or stop in or by appointment.

http://homepages.wmich.edu/~kaldon/classes/ph205-17.htm

PHYS-2060 (Laboratory) is a separate course. You must be registered for PHYS-2060 to take the lab.

Labs start immediately the first week of class (May 11 Th); check outside lab door.

Three-Times Rule: It is University policy that the number of times a course can be taken is limited to three (including withdrawals). A student whose current enrollment is in violation of this policy must drop this course as soon as possible and no later than the deadline for no refund of tuition.

C-or- Better Requirement: It is Department policy that a grade of “C” or better in a prerequisite course is required before enrollment is permitted in the next-sequence course. A student who does meet this requirement must drop this course as soon as possible and no later than the no-refund deadline.

Required Texts and Supplies:
Physics for Scientists and Engineers (6th edition) / Serway and Jewett  
Volume 1 or First Half of Full Textbook · Henceforth known as “Serway” in class.

Standard inexpensive calculator with trig functions and logs. No TI-92/89MACHINES!

Optional Materials: None, really. If you require an integral table or other math handbook, CRC Press’ Standard Math Tables (or whatever it is currently called) is highly recommended; this is the source for the integral tables in the textbook. Study guides from Schaum’s, or the textbook’s A Student Solutions Manual and Study Guide, are available (or can be ordered) from the bookstore. These may be helpful for some people, but are not required and have not been used in the preparation of this course. There are also study software packages for Physics, but I haven’t seen one that looked worth the money; so you might as well work the assigned Homework!

Prerequisites: MATH-1220 (or equivalent) is required for PHYS-2050. A working knowledge of calculus, algebra, geometry and trigonometry is expected for this course. Since Physics is a kind of applied mathematics, if you feel uncomfortable about your math skills, don’t delay if you need help!

Co-requisites: PHYS-2060 (the laboratory) and MATH-1230/1710 are co-requisites for PHYS-2050.

† This Syllabus may also cover anyone enrolled in PHYS-2140 Mechanics and Heat Problems (Pre-Requisites PHYS-1130 and MATH-1230/1710 or equivalent) - PHYS-2140 is the one credit hour conversion course from the Algebra Physics sequence to the Calculus Physics sequence. To register, you must contact the Physics Dept. Office, 1120 Everett Tower. Other than registration, the PHYS-2140 course is the same as PHYS-2050.

For many of you, the minimum grade you need in this course is a “C”. That means you need to earn at least 750,000 points. Read this Syllabus carefully and keep current in class.

Course Descriptions from the WMU Undergraduate Catalog via Registrar’s Web Site

PHYS 2050 Mechanics and Heat
4 hrs. Fall, Winter, Summer I
This first course in a sequence of three in calculus-based physics deals with mechanics and heat. PHYS 2050 is intended for physics majors, engineering students, and future physics teachers, and is recommended for majors in other sciences. A student cannot receive credit for both PHYS 2050 and PHYS 1130. Prerequisites : MATH 1220 or MATH 1700. Corequisites : MATH 1230 or MATH 1710.

PHYS 2060 Mechanics and Heat Laboratory
1 hr. Fall, Winter, and Summer I
This is a laboratory course which includes exercises related to topics covered in PHYS 2050. A student may not receive credit for both PHYS 2060 and PHYS 1140. Corequisites : PHYS 2050.

Significant Dates:
May 8 Mon - PHYS-2050 Begins for Summer I Session 2006
May 11 Thu - Regular Daily Quizzes Begin
May 12 Fri - Drop/Add Ends (100% Refund)
May 12 Fri - Last Day to Drop without “W”
May 18 Thu - Hour Exam 1
May 24 Wed - Hour Exam 1L – for students enrolled after Week 1
May 29 Mon - Memorial Day < No Classes >
June 5 Mon - Last Day to Drop with “W”
June 15 Thu - Hour Exam 2
June 15 Thu - Topic 1 (Book Report) (due by 5pm Thursday) June 19 Mon - Grace Period for Topic 1 ends at 5pm
June 23 Fri - Last Regular Day of Class
June 26 Mon - Review Class
June 27 Tue - Final Exam Noon-1:40pm (2 hours) “
June 28 Wed - End of Summer I Session @ Noon
July 3 Mon - Grades Due at Noon

“All Exam dates are fixed in stone.” See Dr. Phil otherwise.

Grading Scheme: A AB B BC C CD D E
%-age 100-95 94-90 89-85 84-80 79-75 74-70 69-65 64-0
Raw exam scores may be curved.
The Million Point Grading Scale:

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<tr>
<th>Component</th>
<th>Points</th>
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<tr>
<td>Quizzes</td>
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<td>Papers</td>
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<td>Exams</td>
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<td>Final</td>
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The Textbook: You will very quickly learn that Dr. Phil does not drone on and on, reading straight out of the textbook (Serway). In this class, the textbook serves as a "second voice" so that you can see the same material presented in a different way, with different examples. We will not necessarily go in a linear fashion through the book, despite the Topic calendar on the last page of the syllabus. You should keep up with where we are in the textbook as part of your daily study habits. In addition, you should make it a habit to check the class web site, which also includes a brief discussion of what was covered in class, along with some important examples and equations. The time to ask questions about differences between what is in your notes (which may or may not be what was on the blackboard) and what you find in Serway, is the next class period. Most of the differences come from differences in notation, or from errors in transcribing Dr. Phil’s enthusiastic but sometimes illegible scrawl on the board. Occasionally mistakes crop up—you’ll notice that Dr. Phil doesn’t work from prepared notes, preferring to work “without a safety net” — we try to correct them As Soon As Possible. Bottom line? You always have something to do when you use your notes and your books to good advantage. Don’t get behind—the next test is sooner than you think!

New or Used? There’s no denial—buying a Physics textbook is expensive. The Old Rule was that it was a Significant Investment, part of your growing library of reference tools that you will keep and use throughout your career. One look in Dr. Phil’s office should convince you that I have never sold a single textbook. But today, most students “rent” their texts, selling them as soon as they are “out of here”. That means that for an edition that has been in use for several years, like Serway’s 6th edition, there’s plenty of used copies around. So should you buy New or Used? Here’s a hint: You want CLEAN. There have been studies that show that previously marked-up or highlighted textbooks may do you a real disservice: (1) Your eye will be drawn to whatever the previous reader marked, not what is emphasized by the author—remember the author and publisher are being PAID for being professionals, the previous reader is NOT; (2) Different readers mark or highlight differently—some mark only what is important, some mark what is difficult or obscure, some are trying to cross out what they don’t need—any way you cut it, it is unlikely you would mark it the same way; (3) Simple statistics should convince you that the average marked-up copy you pick up was marked by a less than ace student—we don’t hand out A’s in Physics, you earn them. Now Dr. Phil is NOT trying to tell you to buy new books, but he IS urging you to invest your money wisely. Remember, relying on someone else’s marking, when it is YOUR career, your grades and your tuition money you’re dealing with, means you should really give this some thought. As far as your own marks—hey, it’s your book. But remember that light pencil erases and Post-It™ notes are removable.

Homework: Serway offers two kinds of problems at the end of each chapter: Conceptual Questions and Problems. The Conceptual Questions tend to be descriptive thought questions, rather than pound-equations-into-your-calculator problems. You should skim through these as a review, to see if you understand the material. Most quantitative problems keyed to each section, as well as Additional Problems, which tend to cut across sections. Each Problem has been coded in the text: black, blue and red (or easy to hard). Which problems should you do for homework? Well… all of them. Or at least all that you need to do. It’s part of the daily work you need to do to keep up. The study of Physics at this level is also a study of problem solving and practicing the manipulation of variables and formulas. This H.W.
your self-made formula card. Dr. Phil can be very generous, but when he calls for all papers to be turned in, you must turn them in – if you want it graded.

![Star Points:](image)

[Read more than once – no one seems to understand this concept the first time!]

In addition to the normal scoring of the 3 Exams and the Final, each of these tests will have four parts designated with a star (*). There are 100,000 Star Points that will be awarded on a primarily all-or-nothing basis in addition to any partial credit you earn during normal test scoring (20,000 Star Points on each regular Exam; 40,000 Star Points on the Final). All Star Problems will involve the use of calculus, and Star Points will be awarded on the basis of a correct calculus set-up and evaluation (if required). A quick analysis of the points and the grading scale, should convince you that it will be impossible to get an “A” (and hard to get a “C”) in the course on the basis of using algebra, trig and geometry alone. This is intended to keep everyone honest, including Dr. Phil, and to identify some of the key points of the course. You may be very surprised to find that working, practical calculus is not like what you did in math class!

The Professional Concerns Committee of the Faculty Senate recommends that all faculty include the following paragraph in each syllabus that they prepare for the upcoming semester:

“You are responsible for making yourself aware of and understanding the policies and procedures in the Undergraduate (pp. 274-276) [Graduate (pp. 25-27)] Catalog that pertain to Academic Honesty. These policies include cheating, fabrication, falsification and forgery, multiple submission, plagiarism, complicity and computer misuse. If there is reason to believe you have been involved in academic dishonesty, you will be referred to the Office of Student Conduct. You will be given the opportunity to review the charge(s). If you believe you are not responsible, you will have the opportunity for a hearing. You should consult with me if you are uncertain about an issue of academic honesty prior to the submission of an assignment or test.”

**Sorta Important Stuff**

**The First Thing You Should Do Each Day When You Come Into Class…**

(after getting comfortable, turning off your cellphone and pulling out your notebook and pencil)

...Is To Take OUT Your Calculator And Have It Ready At All Times

(it doesn’t do you any good all closed up in your book bag, or at home)

Grading:
The process and the concepts are so important, that getting the correct numerical answer is sometimes the least important part of a calculation. Therefore, there will be some partial credit on some exam problems for taking the correct line of reasoning, even if the answer is wrong. This does not excuse you from taking reasonable care in a calculation. (Grading this way is very labor intensive, but your patience will be rewarded.) You can argue all day long that you had the “right answer”, but if you did not show sufficient work or physically correct work, you will not get the points. Your answer is a dialogue between you and the graders – it must be intelligible and “legal” math and physics – we cannot grade “what you meant”.

**Units, Numbers and other parts**

For a business that relies so heavily on numbers, it is very rare that the answer to a Physics problem is just a number, like “five”. “Five what?” is usually a reasonable question, so units are a very important part of a number. Units will save your life, if you bother to keep them with their numbers and learn to reconcile them. Otherwise, you will be doomed to getting useless results because you plug 9.8 m/s² into a length or a velocity, or end up with a resistance in meters instead of ohms.

So many errors in Physics problems can be traced back to the use of the wrong “thing” in a variable, sometimes to the point where even I can’t figure out what you were doing, that we are going to be very, very, very hard on units this semester. So here’s the new rule:

**UNITS ARE TO BE CONSIDERED PERMANENTLY STAPLED TO A NUMBER.**

Every time you write down a number, you write down the units as well. This means (a) when you write down the numbers in the beginning of the problem, (b) when you write down your answer and (c) most importantly, what Dr. Phil calls Internal Units – that means when you are writing down a number in an algebraic expression before you haul out your calculator. There will be no alternative here, because otherwise you won’t be scoring any points here on quizzes and exams. You’ll notice that Dr. Phil always includes units with his numbers on the blackboard – take that as a hint.

Likewise, the sign of an answer can be very important in some problems. Your bank has no trouble with telling the difference between having a $500 checking account balance and being overdrawn with a -$500 balance, for example; these are very different answers. One must also watch out for powers of 10, since the metric system is based on a decimal system, just like the American money system. Another number problem: 4.97 is a number that is about five, but 4.97 is not the same as 5.00. Your calculator is not very intelligent, so you must determine which numbers in the display represent significant figures, based on the actual numbers you used as input to your calculations. This is particularly important in lab; in lecture and discussion, you will find that we tend to use “reasonable” numbers in answers. I cannot guarantee that you will get exactly the same answer as I do, since the order you do math operations and the brand of calculator can have some impact on the final result. As a general rule, do not truncate or round numbers too much in intermediate calculations or dump your entire calculator display into a final answer.

Also – we do not normally deal in fractions. 1 2/3 is 1.67 to three significant figures.

**Laboratory:**

Lab is an integral part of any serious study of Physics. You may or may not be taking the lab course, PHYS-2060, at this time. I can help you with general physics questions, but I am neither responsible for the laboratory nor inclined to help you write-up your results.

**Make-Ups:**

In-class Quizzes cannot be made up. You are expected to attend classes anyway, but this is especially true of laboratories and examinations. Provided you have a valid reason for missing class (illness, etc.), if you miss: (1) a lab you must contact the appropriate instructor as soon as possible to see if you can make up the lab; (2) an exam, you must contact me as soon as possible to arrange an exam within a few days. There are no guarantees that late exams will be the same (or of the same difficulty) as the in-class exam.

This is summer in Michigan – Land of Driving Adventures. Dr. Phil has a long commute (154 miles/day) and we are in the middle of massive construction projects and we are still waiting to see what new paving contracts blow into town. Dr. Phil will make gallant efforts to be here on time every day – but ultimately all of us have to be intelligent enough to make decisions between trying to get to class and oh, say… living. Physics is important, but if you or your vehicle can’t make it, then you can’t make it.

**Late Quizzes:**

This includes units with his numbers on the blackboard – take that as a hint.
Most take-home quizzes can be turned in by 5pm on their due date if they are not ready to turn in at class time. Some take-home quizzes may be made up, provided the solutions have not been given in class or posted on the class web site. If Dr. Phil starts going over a quiz problem you have not turned in, please turn it in immediately. If two or more quizzes are being turned in on any given day, PLEASE make sure that they are in separate piles.

“My Side” of the Table
It’s a small point, but the front lab table is divided in Dr. Phil’s mind between “my side” and “your side”. Please do not ever pick up papers from Dr. Phil’s side of the table. Sometimes they are not for your class, sometimes they may be your papers that have not yet been recorded in your grading spreadsheets. (If they are never recorded, then they are still yours.) You may think that it makes sense to grab graded papers from both sides of the lab table, but that blocks my access to my piles and the blackboard, which slows things down for everyone. So, “stay on your own side of the table” will make things move smoother for all.

What’s My Grade?
Part of keeping up with the workload in PHYS-2050 is knowing where you stand in the class. There is a delay, however, between when work is handed in and when it gets back to you. We endeavor to get Exams back to you within a week of when they are given. Quizzes have tended to get batched and backlogged – a new system since Spring 2002 sometimes gets quizzes turned around faster. Grades are recorded in a Microsoft Excel 7.0 spreadsheet. After the first exam is graded, Dr. Phil will create The Predictor, which basically fills in all the final grade columns with estimated answers, even though much of the work of the semester has not been actually done yet. The Predictor uses actual Exam, Star and Quiz scores to estimate what their final values will be, based on your past performance. By the time 7 to 10 quiz grades are recorded, The Predictor will start dropping your three current lowest quiz grades. The Topics (such as the Book Report) are automatically given the lowest “B” grade of 85%. Once The Predictor is set up, you can always stop by office and see what your current projected grade is, or send me e-mail (along with your PHYS-2050 Personal ID number [PID] ) and I will e-mail your current projected grade. Posting grades on Dr. Phil’s office door or at the back of the lecture room is usually done around the exams, sorted by your 5-digit PID, but this information has a short shelf-life. Check the Post date on the printout. During Spring 2001, someone kept stealing (or just throwing out) my printouts, which is very bad behavior. In Fall 2005, Dr. Phil experimented with posting estimated and final grades on the website.

What’s The Answer?
I am currently making available solutions to the Exams, so that you will know what the correct (or at least Dr. Phil’s version) answer to a problem is. Most quizzes will be gone over the next class period, again so that you will have the correct answer. (Check the class website!) This is easiest for the in-class quizzes – take-home quizzes have a tendency to dribble in over a few days, so there’s no point in giving the answer before they get their point. I do not usually give out answer sheets to the Sample Exam Problems, on the theory that you don’t have the answers on a real exam, so you need to learn how to PTPB – and it encourages students to study together, compare notes or even come to Dr. Phil’s office hours. Sometimes I feel like the Maytag™ repairman – it’s lonely in my office at office hours.

Extra Credit:
I don’t “do” extra credit. Students who wish extra credit primarily do so because they aren’t using their time effectively already, so why would I wish you to divert even more of your valuable time on additional work?


table

### Interesting (7) Thoughts

#### Natural Philosophy

Physics was once called Natural Philosophy in colleges and the term has some very good connotations. Physics is a study of Nature and how Nature operates. Physics is often a philosophical arena, where meaning and understanding are gleamed, debated and tested from observations of the real world, experiments in the laboratory, with theories and long “what-if?” and “what-about?” sessions. I often suggest to students that “We are here to change the way that you think” and this is borne out in the many students who comment at the end of the course that they do think about and see the world in a different way. Many tell of how sick to death their friends and family are to here them babble on about “this is how that works” or “don’t you wonder why that happened?” Most people go through life not thinking those thoughts or asking those questions. (Or else believe that it must be too difficult for them to understand.)

#### The Million Point Grading Scale

You may have noticed the outrageous number of points assigned to our workload. Over the years I have found that many people don’t have a good feel for very large and very small numbers, things we will be using a lot in PHYS-2050, so I created The Million Point Grading Scale as a kind of numerical literacy device. It breaks the unusual mild of 100 point tests and eliminates haggling for points. Anyone who wants “a” point, can have one. You must complete all elements of the course in order to earn the rest of your points, however.

#### Common Sense

It is an asset to make a guess about what is going to happen in a problem. However, you must watch out that you let the Physics do its work and not talk yourself into a mistaken notion. It is sometimes thought that good Physics thinking is just good Common Sense. All of us have some idea how at least part of the world works, but Common Sense doesn’t always seem to be so Common among us, or so Sensible. Instead, we will work to a logical model of how things work, one that is independent of personal feeling (red cars don’t really go faster than blue ones, but they get more tickets). This is not easily done, since most students don’t get very much Physics education early on: a survey done a few years ago suggests that even students in graduate physics classes tend to write one thing on a test paper and believe in their “common sense experience” in everyday life. But don’t despair – there are a lot of common sense experiences that do work in Physics under the appropriate conditions, such as “what goes up must come down.”

#### Bud Chapter Karma

From Chapter 1 to 22 in Serway is twenty-two chapters. From May 8th to June 27th is less than seven-and-a-half weeks of classes – in fact, there are 29 total classes, 4 of which are taken up by exams, 1 by introduction and 1 by review. It shouldn’t take advanced calculus to figure out that there is a mismatch here – that we have to keep going with one chapter per class. And two of the chapters really take more than one day to wade through. On the other hand, we may adjust the topics list as we go, and we might drop some sections or chapters as we go along, or at the very least, touch on some topics without devoting critical exam and study time on them. Note the chapter lists that go with each exam. And two of the chapters really take more than one week to wade through. On the other hand, we may adjust the topics list as we go, and we might drop some sections or chapters as we go along, or at the very least, touch on some topics without devoting critical exam and study time on them. Dr. Phil intends to try to keep up on schedule better! Note the chapter lists that go with each exam.

#### Concepts

It is possible to teach an entire course in “Conceptual Physics”, where one hardly ever sees a number or an equation. This isn’t one of those courses, because the equations and the numbers have so much interesting meaning attached to them, that it would be a shame to leave them out. But it is very easy to lose sight of the Concepts amongst all the math. Short answer conceptual questions on exams should be almost “freebies”, but usually aren’t because the most basic definitions are forgotten in the cram for the details of specific cases. Learn the definitions and the general concepts, and the specific cases will take care of themselves.

#### Vocabulary

It is not surprising to think that a science such as Physics should have developed a vocabulary of its own. But Physics tries to be a precise description of the world and so therefore the meanings of many ordinary everyday words must take on a new precision of their own, too. We will see that mass and weight are very different, even though they might seem to describe the same thing. Or that work has a special definition, a precise meaning, that is understandable to physicists and physics students around the world. Indeed, the concept of doing “no work” in Physics is very different from the usage we have in everyday speech.

#### Equations

Physicists are capable of driving other people crazy, as we can happily work all day with equations without ever once feeling the need to plug in a number. The concepts and the theory frame the question and the answer, it is the equations that supply the tools for our solution. In reducing numbers down to letters, we are limited by the number of upper and lower case letters in the English and Greek alphabets. Therefore, what “v” might represent in any equation must not only be known, but “v” and “V” are also likely to be different from each other, as is “\nu” (Greek lower-case nu).
Formula Card
You will be allowed to bring your very own formula card to quizzes and exams. This being a "serious" physics course, you are responsible for maintaining this formula card. Dr. Phil will give you constants during a quiz or exam, such as $G = 6.67 \times 10^{-11} \text{ N m}^2/\text{kg}^2$, but he will not give you formulas. Factory-made study sheets and formula cards from the bookstore are not allowed, because they are not your work.

Theory
The theories presented in this course have a long and colorful history that is interesting in its own right. Much like case law to the legal profession, current physics theory has been "tried and proven" over the years. Unlike law, however, it isn't how slick or well-paid your physicist is versus mine, here the burden of proof falls on experimental verification. Even so, "proof" is too strong a word for some in science, rather one might say that something is true within these limitations. Much of what goes on at the forefront's of Physics today involves the same topics that we will cover in PHYS-2070. However, much of the details of Modern Physics is left for a third semester course - PHYS-3090. But everything depends on knowing the material from PHYS-2050, and knowing it well. You will be astonished at how much you'll need in 2070!

Experiment
Years ago I saw a T-shirt that said "If it’s Green and Wriggles, it’s Biology; If it Stinks, it’s Chemistry; And if it doesn’t work, it’s Physics."

Buy a Cheaper Calculator!!

My view of the situation is this: Very few students who buy a fancy calculator in order to substitute its power for their studying, do very well. Frankly, from what I've seen, most students find that either too general, too specific or just too inconvenient to be useful, and most students find that either rule, and a definite drop in the ability to do simple error-free mathematics. When I was in college, there were stories about MIT and Harvard being concerned over students "cheating" with programmable calculators. A typical Dr. Phil Exam is 4 or 5 pages long, each page is a single long involved problem with usually five parts. The quizzes are most like the sectional end pages and the exams are more like the red and Additional Problems. You can't do the latter until you understand the former.

Time Management (Exam)
There is no one equation to "Life, The Universe and Everything". Every equation developed has some built-in limitations and some very real restrictions on when you can and can not use them. There are plenty of examples done in class and the text which result in equations to solve a particular case. Students are inevitably tempted to use such "killer equations" for any problem that involves those quantities, because they think that the work has been done for them. The range equation is a classic example in ballistics, but this equation cannot be used unless the launch points and landing points are at the same height. Despite that warning, freely given in class, the range equation will be used to find out how far away a arrow will land, even if the archer is standing on a hilltop. In most cases, you are better off using the more basic, more general, more useful equations than searching for that "killer equation" that will solve the problem with one plug-in. Somehow the latter hardly seems like the kind of examination that would prove that you had learned anything.

Show ALL Work Means Having Some Work to Show

Graphing Calculators
Just in the years that I have been in school, I have seen the rise of the calculator, the disappearance of the slide rule, and a definite drop in the ability to do simple error-free mathematics. When I was in college, there were stories about MIT and Harvard being concerned over students "cheating" with programmable calculators. As a physics TA, I found students who used the old TI-30-II's white face to pencil in all their formulas between the keys. Such cheating is not necessary, because I allow you a formula card up front. Today, the Texas Instruments TI-80 series graphing calculators are virtually standard issue in many college math and physics departments. Top flight calculators not only contain Physics, Math and Engineering equations built-in and powerful symbolic math programs that will handle fractions, algebraic and calculus equations, and accept additional sets of science and engineering formulas. It is even possible to transfer data and equations between calculators via cables or infrared (IR) transmitters/receivers.

Inappropriate Formulas (IAF!!!)

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Inappropriate Formulas (IAF!!!)

Killer Equations
There is no one equation to "Life, The Universe and Everything". Every equation developed has some built-in limitations and some very real restrictions on when you can and can not use them. There are plenty of examples done in class and the text which result in equations to solve a particular case. Students are inevitably tempted to use such "killer equations" for any problem that involves those quantities, because they think that the work has been done for them. The range equation is a classic example in ballistics, but this equation cannot be used unless the launch points and landing points are at the same height. Despite that warning, freely given in class, the range equation will be used to find out how far away a arrow will land, even if the archer is standing on a hilltop. In most cases, you are better off using the more basic, more general, more useful equations than searching for that "killer equation" that will solve the problem with one plug-in. Somehow the latter hardly seems like the kind of examination that would prove that you had learned anything.
Ixan on the TI-92 – It’s Not a Calculator (And the TI-89 is gone, too, as well as their successors.)

The TI-92 machine has been around for a while – it’s easy to spot because it has a QWERTY keyboard. Some have found them to be a klutzy difficult calculator, but as the largest “calculator” on the market, they have real geek appeal. While I can appreciate that having something big and powerful is cool, the fact is that the TI-92 became a reality in 1998. Several students were using its symbolic math routines and it became painfully obvious that they could barely do the calculus on their own. Worse, because they don’t know what they’re doing, they don’t get it right using their fancy machinery anyway. So I am tired of messing with these things – the TI-92 family and any other so-called calculator with a QWERTY keyboard are OUT. The TI-89, I believe, is the same as the TI-92 without the keyboard. It’s OUT, too. Not allowed. End of story. If your ordinary looking graphical calculator does symbolic math, better talk to Dr. Phil. This may include the HP-48 and others – see the next section to learn about more problems.

Algebra and Calculus versus The Solver

Solvers and graphical solutions to problems offer interesting checks to your work, but since one of the grading requirements is that you “show your work” on the paper, unless you intend to staple your calculator to each problem, you simply can’t get any credit for simply using your Solver function. It is the same thing as “doing the work in my head” – unless you intend to staple your head to the paper, you won’t get credit for the work. You should also know that these alternate calculator methods do not always work properly. Dr. Phil’s suggestion is simple: Learn to do the math with pencil and paper.

MTBF (Mean Time Between Failures)

No, this isn’t some sick statistic on awarding F’s to students. MTBF is actually a term to describe how often computer equipment breaks down. I have seen many three and four year old calculators get chewed up in PHYS-2050 and learning to use a new calculator in the middle of a course can be traumatic. In the mid-90’s many of us carried two calculators to exams, just like one of them tubed out on us. Today’s calculators are a lot more reliable than in those “old” days, but there still are plenty of “biodegradable” units that were never built to survive more than a year or two. While I can appreciate that no one wants to spend more money, we do depend a lot on our calculators in a course like this, and having a calculator that has keys that don’t work right is just begging for trouble. Do yourself a favor; if you need a new calculator, buy it now, before a change becomes unsettling. At the very least, many older calculators need new batteries right about now. You’ll thank me later. Dr. Phil just changed the AAA’s again in his 1995 HP-48GX in 2005 – one set of batteries seems to last me 2 to 2½ years… not forever.

“I Understand the Physics, I Just Can’t Do The Problems”

This is a refrain that is heard all the time. Yet the truth is that if you can’t do the problems, then you probably don’t really understand the physics. Physics isn’t just equations, however, it is what you do with them. Often, people who have trouble with doing the problems, also don’t have a clue as to what the correct answer should look like. If you really understood the physics…

Practice, Practice, Practice

Very few people are so talented that they can leap into any new endeavor and have permanent success without every practicing. Beginner’s luck usually doesn’t last very long. So you’re in a Physics class… what do you do? Well, besides coming to class, reviewing your notes, opening your textbook occasionally, the best advice is to do some Physics problems. Start with the assigned (i.e. recommended) problems. If you have problems, don’t just race to the answers in the back of the book, or look for posted solutions, try looking at the worked out examples in the text or from the class and reproduce that work.

PFTPBIIP (Put The Physics Back Into the Problem)

So you’ve read the problem, figured out what’s given, determined what is being asked for, decided on what equation(s) you need and played plug-in-chug on your calculator. So you’re done, right? Well, how do you know if the answer is right? First off, you can check to see if the answer makes sense. This is what I refer to as “PFTPBIIP”, Putting The Physics Back Into the Problem. It is very important, “real” physicists do it all the time. You needn’t write anything extra down, but if you expect that the block should go to the right, then it is very satisfying if your answer also says that the block will go to the right. It may be that the block will go to the left, and that the Physics is trying to tell you something, but rarely will a horizontally moving block travel up. That would be a hint that something funny is going on.
Physics is Phun:
No one ever believes that on the first day. And for some, it never is fun. But we can try! Really!

Credentials: Dr. Philip Edward Kaldon - Born western upstate New York; Junior High near New York City; High School in Greensboro, North Carolina (1976). B.A. Integrated Sciences, Northwestern University (1980); M.S. Physics, Michigan Technological University (1986/88); Ph.D. in Applied Physics, Michigan Technological University (1989). Physics Teaching: WMU, KVCC, GVSU, Hope College. Former President—Michigan Section of the American Association of Physics Teachers (MIAAPT). Dr. Phil pursues many science and science literacy efforts, and on the first day of class, he is on Day 3054 of writing a massive science fiction romantic epic novel. A fourth readable draft of a complete novel, The Devil's Coffin, set in the same sci-fi universe, is on Day 1872. No--it's not ready for you guys to read yet. After sending out thirty-seven short stories one-hundred times, Dr. Phil has two stories published in anthologies and four more slated for publishing in 2007-7. "The Pulse of the Sea", Dr. Phil’s first commercial sale, was published in September 2005. No -- Dr. Phil has no intentions of making you read his fiction. But he did attend the prestigious 2004 Clarion Science Fiction and Fantasy Writers Workshop, an intensive six-week boot camp for SF writing, so he is well on his way to becoming a real science fiction author!

Why We Do All This:
Science literacy n. An exposure to science in a historical context that serves to allow a person to observe the world around them with understanding, deal with technological applications at home and work, appreciate the distinction between fact and speculation in the media and politics, have a working knowledge of numbers and the scale of the universe, and be able to pursue more information if desired, as a function of everyday life.

Philip Edward Kaldon, Fall 1995

The Disclaimer
This Syllabus has been revamped, rewritten, re-spellchecked, re-edited, re-etc., more times than I can count for different Physics courses. Occasionally old, out of date material remains from Hope College or GVSU or WMU or KVCC, for which I apologize. If there are real errors, you will be notified!

We Are Here To Change The Way You Think - There Are No Stupid Questions
(Just Ones That Half The Class Wanted Asked Anyway) -
UNITS Will Save Your Life -
PTPBIP ! (Put The Physics Back Into the Problem!) -
Physics is Phun (This is the Fun part. Are we having Fun yet?)

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<thead>
<tr>
<th>Week</th>
<th>Class Dates</th>
<th>Topic (Serway – 6th ed.)</th>
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<td>8,9 May</td>
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<td>Ch. 1 - Physics and Measurement</td>
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<td>11,12 May</td>
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<td>Ch. 4 - Motion in Two Dimensions</td>
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<td>Exam 1 - 5/18 Thu.</td>
<td>Quiz 1,3</td>
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<td>3.</td>
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<td>22,23 May</td>
<td>Ch. 7 - Work and Energy</td>
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<td>Ch. 8 - P.E. &amp; Conservation of Energy</td>
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<td>25,26 May</td>
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<td>Ch. 10 - Rotations … About Fixed Axis</td>
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<td>29 May</td>
<td>Memorial Day &lt; No Classes &gt;</td>
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<td>30 May</td>
<td>Ch. 11 - Rolling Motions… Torques</td>
<td>Quiz 10,11</td>
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<td>Exam 2 - 6/1 Thu. (Ch. 4-9)</td>
<td>Quiz 12</td>
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<td>8,9 June</td>
<td>Ch. 14 - The Law of Gravity</td>
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<td>16</td>
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<td>Ch. 18 - Superposition &amp; Standing Waves</td>
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<td>Topic 1 due - 6/15 @ 5pm</td>
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<td>22,23 June</td>
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<td>Ch. 21 - Kinetic Theory of Gasses</td>
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<td>26 July</td>
<td>Ch. 22 - Heat Engines &amp; 2nd Law of Thermodynamics</td>
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<td>27 June</td>
<td>FINALS</td>
<td>Final Exam - 6/27 Tue - Noon - 1:40pm</td>
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3 July Grades due on Monday at Noon