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PHYS-115 (4) General Physics II (26364-Kaldon)

Western Michigan University

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Spring 2005
Version 4.05

Class: MTuWThF 3:00-3:50pm 1104 Rood Hall
Office Hours: MWF @ 11am, M WThF @ 1pm, M-F @ 2pm or stop in or by appointment.

http://homepages.wmich.edu/~kaldon/classes/ph115-4.htm

PHYS-116 (Laboratory) is a separate course.
You must be registered for PHYS-116 to take the lab.
Labs probably start the second week of class (January 9 Tu); 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:

College Physics (6th edition) / Serway and Faughn
Standard inexpensive calculator with trig functions and logs. ***NO TI-92 MACHINES!***

Optional Materials:

None, really. Study guides from Schaum's, or the textbook publisher are available (or can be ordered, but probably not in time for this short spring course) 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: PHYS-113 (or equivalent) is required for PHYS-115, with a grade of "C" or higher. A working knowledge of algebra, with some 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 getting help!

Co-requisites: None.

Course Descriptions from the WMU Course Registration Web Site

(http://sims.wmich.edu/)

PHYS 115 - General Physics II **4 hrs. Fall, Spring and Summer II**
This course follows PHYS 113 and consists of studies in electricity, magnetism, light, and atomic and nuclear physics. Prerequisite: PHYS 113.

PHYS 116 - GENERAL PHYS II LAB **1 hr. Fall, Spring and Summer II**
This is a laboratory course which includes exercises related to topics covered in PHYS 115. Normally this course is taken concurrently with PHYS 115. A student may not receive credit for both PHYS 116 and PHYS 208. Corequisite: PHYS 115.

Note: This Syllabus is Updated from files for previous semesters and previous courses. Every attempt has been made to keep it current to the spring 2005 Semester and PHYS-115 at Western Michigan University. Please Report any errors or inconsistencies immediately to Dr. Phil.

Significant Dates:

Jan. 4 Tue	- PHYS-115 Begins for Spring 2005 Semester
Jan. 6 Thu	*- Regular Bi-Weekly Quizzes Begin*
Jan. 10 Mon	- Drop/Add Ends (100% Refund)
Jan. 17 Mon	- WMU Dr. Martin Luther King, Jr. Activities < No Classes >
Jan. 27 Thu	**- Hour Exam 1**
Feb. 24 Thu	**- Hour Exam 2**
Feb. 25 Fri	- Last Day to Drop without "W"
Feb. 25 Fri	- Spirit Day <No Classes>
Feb. 25 Fri	- Semester Recess begins at 6pm
Mar. 5 Mon	- Classes Resume
Mar. 21-25	***- March Meeting of the American Physical Society, Los Angeles CA***
	- (Dr. Phil will probably not be attending this year.)
Mar. 25 Fri	- Good Friday (not a WMU holiday)
Mar. 31 Thu	**- Hour Exam 3**
Mar. 31 Thu	***- Topic 1 (Book Report) (due by 5pm Thursday)***
Apr. 4 Mon	***- Grace Period for Topic 1 ends at 5pm***
Apr. 15 Fri	- Last Regular Day of Class
Apr. 20 Wed	**- Final Exam 2:45-4:45pm (2 hours)**
Apr. 22 Fri	- End of Winter Session
Apr. 26 Tue	- 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:

Quizzes	(20)	300,000 points	23 given; 3 dropped
Papers	(1)	100,000 points	
Exams	(3)	300,000 points	
Final	(1)	200,000 points	
Worksheets	(5)	100,000 points	

1,000,000 points

Homework: Homework will be assigned for each chapter. Serway & Faughn 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. A few of these are included in the Problem assignments; they are marked *C* for *C*onceptual. Serway & Faughn also have quantitative problems keyed to each section, as well as Additional Problems, which tend to cut across sections. Each Problem has been color coded in the text: black (easier), **blue (moderate), magenta (more difficult).** These Problems will not be turned in, but you will be responsible for it. You are expected to be able to do the assigned Problems, but do not waste too much time if you can't see how to solve a Problem. Odd-numbered problems have answers given in the back of the book; an instructor's

solution manual (it was known as **The Green Book** in 1997) will be brought to class (or available in my office) for you to check out specific questions. It does no good to just hand out detailed solutions for all the problems, because then people tend not to actually work on the H.W.

Work To Hand In: All work that is to be handed in (which includes Quizzes, Exams, Papers, Special Topics) must include your name (you'd think that would be obvious, but…). – PAPERS WITHOUT NAME AND SECTION NUMBER MAY NOT BE GRADED! **Staples:** Any papers turned in that are supposed to be stapled, but aren't, are subject to a 3000 point penalty. Any papers turned in with a *fold-and-tear* corner will get an automatic 5000 point penalty. **Late Papers:** lose 10% (one letter grade) per day, but it is better *to do the work at all* than turn in nothing.

Writing Assignments: There will be an outside reading and writing assignments: IF YOU HAVE HAD DR. PHIL BEFORE, THIS IS A NEW AND DIFFERENT ASSIGNMENT! Complete instructions will be in the book/movielist handout. It is due Thursday 31 March 2005 by 5pm. There will be a penalty for each day a paper is late. *Be sure to read the assignment at the end of the book/movielist!*

Quiz Schedule: Expect to have a quiz twice a week (starting January 6th). Quiz problems will be based on the assigned homework UNITS, SIGN, POWER OF TEN and VALUE of your ANSWER will all be evaluated on numerical problems. Reasonable units and significant figures are required. You must CIRCLE your ANSWER. Work must be shown to receive credit, though the work itself may not be evaluated. There will be twenty-three 15,000 point quiz problems; the lowest three will be dropped. There will be no further adjustment of quiz grades. Quizzes may sometimes be graded on an "all-or-nothing" basis and cannot be made up, though up to three zeroes can be dropped.

Exam Schedule: There will be three hour exams, tentatively scheduled for: **27 January 2005, 24 February 2005 and 31 March 2005 – all these are on THURSDAY.** Each exam will cover about three weeks of material and you can have the entire period to work. These exams will be closed-book, but you will be allowed to bring a **FORMULA CARD**. On this card, no larger than 5"x7" (127mm x178mm), you may write down any formula, physical constant, definition or a brief note on any historical figure that you feel is relevant or useful; short examples are allowed but *you may not include worked out problems*. Formula cards will be turned in with the exam, with a deduction for an illegal formula card. Each exam is worth 100,000 points. Scores may be adjusted on a curve to meet the Grading Scheme noted above. Exam questions will vary, but will include some complex problems that will test your understanding of and ability to apply the material. You may be surprised to hear this, but I do not expect you to be able to do 100% of the exam; in all likelihood, you've probably never taken exams like this before. They won't really get any easier, but you will get used to them. The Final Exam will be **Wednesday April 20th** with a REVIEW class on Friday April 15th. The Final is worth 200,000 points. It is cumulative and you can use your previous formula cards. It may emphasize concepts and relationships over number crunching. If a curve is used on the Final, it will only bring grades up.

Exam and Quiz Policy

For all exams, you are expected to sit with at least one space between you and the next person in your row. For all exams and in-class quizzes: You are allowed your "legal" calculator and formula card(s), and a pen or pencil (do not use red). Pre-printed commercial physics and math summary sheets, such as are available laminated in the bookstore, do NOT count as 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.

Worksheets

In addition to more traditional problem-based, we will have five worksheet projects that will be done out in the Real World and then discussed in class. They are intended to illustrate principles that are harder to see or do. I tried these in 2001 and I think they can be very interesting and useful.

Sorta Important Stuff

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.)

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/s^2 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.

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

(after getting comfortable 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)

Laboratory:
Lab is an integral part of any serious study of Physics. You may or may not be taking the lab course, PHYS-116, 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:
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.

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?

Interesting (?) 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 gleaned, 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 is 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-115, so I created The Million Point Grading Scale as a kind of numerical literacy device. It breaks the usual mold 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). 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."

The Good News and The Bad News

Now that we all have a certain understanding of the physics in the mechanical world, we will find that the PHYS-113 material comes into play in PHYS-115 over and over again. However, PHYS-115 is full of large chunks of new material that you may be unfamiliar with. So on the one hand, you may not have a lot of experience with electric fields or quantum mechanics, so this material is really new (as opposed to already knowing that objects fall because there's gravity, or that applying heat makes the temperature go up), but on the other hand, you may not have a lot of experience with electric fields or quantum mechanics, so that your old non-physics world view won't get in the way. The good news is that for most of you, surviving one semester of Physics has shaped your mind to accept reasonable Physics concepts, so although the material is hard, you may feel better about it.

E&M vs. EE's
Since the people taking PHYS-115 come from a variety of science and non-science majors, it is almost a fair question to ask whether some majors have an advantage. Funny you should ask, because the results aren't exactly what you think! When I was at Michigan Tech, we found that a lot of Electrical Engineering majors would breeze into the E&M course figuring that they had it made. The bad news for them is that although there is a certain amount of simple R, C and L circuits covered in PHYS-115, it is, at best, only 5 of 16 chapters. Instead, we spend most of our time on the field theory that isn't covered in most EE courses. (Also, physicists sometimes view circuits differently than engineers do.) At Tech, we found that the students who had the highest grades often came from Mechanical and Civil Engineering (ME's and CE's), because they were knew they didn't know the material and therefore took the time to study, do the homework and learn it!

Newcomers
If you did not take PHYS-113 the last time it was taught at Western Michigan University in the Fall of 2004, then you should take some time to review the material presented in Chapters 1-14 in Serway & Faughn. This is especially true of those who have used a different book or a previous edition of Serway. Feel free to stop by my office some time and see what you missed.

Bad Chapter Karma
From Chapter 15 to 30 is sixteen chapters. From January 4th to April 15th is *less* than fourteen weeks of classes – in fact, there are 67 total classes, 3 of which are taken up by exams, 1 by introduction and 1 by review. And two of the chapters really take more than one week to wade through. It shouldn't take advanced high mathematics to figure out that there is a mismatch here – that we have to keep going with slightly more than one chapter per week. 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.

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 "**ν**" (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 an exam, such as $G = 6.67 \times 10^{-11}\ N{\cdot}m^2/kg^2$, 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. 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-115.

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". We say that the theory developed in Physics has been verified by Experiment, but surely we cannot mean Physics Lab! Still– reading, thinking and calculating can only take you so far; sometimes you have to see and measure for yourself. The purpose of lab is to put the scientific method into practice and see where event, observation and theory meet. But remember! The theory we develop in class has simplified and "cleaned" up Nature, so we cannot expect perfect experimental results; but careful and repeatable experiments will go a long way to helping you "see" the Physics.

Time Management (Studying)

Since we have a lot of material to cover, and it is probable that you won't have time to work out ahead of time every Physics problem in the book, it becomes important to manage your study time wisely. **It is very common to end up spending hours banging your head against one stupid little problem.** Mostly this involves doing the same solution over and over again, or dragging in every conceivable (and inappropriate) formula under the sun. Most of the textbook problems have only one or two elements in them, so in general you may need to simplify your work, not make it overly complicated. Problems marked in black are considered easy - if you are having trouble with a black problem and some of the blue problems, you are probably making them way too hard. Think basic definitions! If you find yourself spending long hours without getting any benefit, come and see me and we'll try to help. Very few students can get by without doing any work outside of class. *The quizzes are most like the sectional black and blue homework problems; the exams are more like the red problems. You can't do the latter until you understand the former.*

Time Management (Exams)

Staring at an exam page is not the time to learn how to do Physics. Good exam time management starts with being familiar with the homework problems, the basic concepts and the formulas on your formula card. Beyond that, you should remember that most parts of the test are equally important, so don't spend all your time on one problem or part. Go onto another problem that you can do. Don't worry about what other students are doing. The student who gets up and hands their paper in halfway through the hour has used up as much time as they care to (for good or bad); it should have no bearing on your test. Do look through the whole test when you get it, making sure that yours is complete. Do keep units with your numbers and check to make sure that (a) the numbers and (b) the units of your answers makes sense. Don't leave any parts blank if you can help it.

Time Management (Dr. Phil Exams)

A typical Dr. Phil Exam is several pages long with 2 to 4 problems, each problem usually has five parts. Although the whole problem may be more complicated than you typically find in the homework, I generally try to lead you through the problem if you read it through carefully. Look at it this way: this would be one of those "choose four of the following five problems" tests, except you are allowed to work on all the problems. An excellent paper may only score 80% raw. Above all else, remember that you <u>can</u> ask questions during a test. Don't sit there and write "I am lost on this problem", "I am missing the formula here" or "I could do parts (b)-(e), if I knew how to get the answer to part (a)." Instead, if you're stuck on (a), ask Dr. Phil for a number to "use" as an answer to part (a) and go on. Or you can state a *reasonable* assumption of your own, and continue. *"Just put it in writing."* Dr. Phil is not a mind reader.

Still Having Problems?

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 in 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 thing 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.

InAppropriate Formulas (IAF!!!)

Even worse than trying to use Killer Equations, which at least have a passing connection to the subject at hand, is the use of just any old formula that happens to have the "right" letter variable in it! I am getting sufficiently tired of seeing Inappropriate Formulas on exams (one should really have a better laid out formula card and take more care in selecting equations), that you may not get *any* partial credit for the use of "IAF"s in a problem.

Graphing Calculators

Just in the years that I have been in school, I have seen the rise of the calculator, the decline of the slide rule, and a definite drop in the ability to do simple error-free mathematics. The current crop of graphic calculators, typically *Texas Instruments TI-81 through TI-89 models*, seem to be more than a little bit of trouble to many students. As a result, Dr. Phil is NOT a fan of these machines. Worse are the keyboard

type of "calculator," such as the *TI-92 family*. They are way too much for this course. If you are fighting your calculator – then it is no friend to you. Get rid of it. Sell it. Give it to your kid brother or sister.

The Only Calculator You Need

All you really need is a calculator that can the following: the standard arithmetic functions (add, subtract, multiply and divide), the standard trigonometric functions (sin, cos and tan – don't even worry if you don't know what they mean, just look to see that your calculator has these buttons), the standard physics math functions (x^2, $\sqrt{x}$, *log x, ln x,* 10^x, e^x). The current model of the *TI-30* series calculator has all those functions and costs about $15. Dr. Phil is "this close" (imagine Dr. Phil holding two fingers really close together) to imposing a Required Calculator for his courses.

"It Must Be The Pretzels"

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 of their built-in solutions are either too general, too specific or just too inconvenient to be useful, and most students find that either they use that big brick like a regular calculator, or they write their own functions, just as you would write out your own formula card. Those who master the capabilities of a powerful calculator generally end up knowing or learning the subject anyway, so it's not the calculator. I wouldn't worry one iota about whether the person next to you has an unfair advantage because they spent $85-$260 on a calculator, and you didn't. As for transferring data between calculators, folks, it's a little too obvious and way too klutzy to get away with in class. Why not just learn the Physics?

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-115 and learning to use a new calculator in the middle of a course can be traumatic. It became a common sight in the mid-70's to see many of us carrying two calculators to exams, just in case one of them tubed out on us. Today's calculators are a lot more reliable than in those "old" days, but often they were still 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 last changed the AAA's again in his 1995 HP-48GX in Summer 2002 – one set of batteries seems to last me 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 you 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.

PTPBIP (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-'n- chug on your calculator. So you're done, right? Well,

how do you know if the answer is right? Well, first off, you can check to see if the answer makes sense. This is what I refer to as "PTPBIP", 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.

Expectations:

Make a mental note of two things: (1) the grade you realistically would like to get in PHYS-115 and (2) the minimum grade that you have to get. If you aren't sure of the latter, now is the time to check with your department (or your school, for those of you not full-time WMU students). These two grades should represent attainable goals, and given your quiz and exam performance you can plan your study schedule accordingly. Week 6 is not the time to realize that your GPA is too low for you to keep your scholarship.

Drop Dates:

You may wonder why drop dates are so prominently mentioned in this syllabus. Actually it is to make everyone's life easier. Let's face it: most of you aren't so interested (right now) in learning some Physics as in surviving the course and putting that grade in the bank. You will have just taken the second exam on the last possible drop date. If you are concerned with passing the course, I would be happy to consult with you after the second exam (but before they are graded) to give you a quick read on where you stand.

Overloads:

It's a Y2K5 college fact: You are probably taking too many classes and working too many hours. In a perfect world, the best way to do Physics is to abandon everything else and just do the Physics. Since you probably can't do that, now is the time to figure out what you can cut out of your schedule. Hey, it's only for a few weeks, and believe me, you'll thank me later if you at the very least arrange a few days off before each exam.

Study Groups:

You may find that studying by yourself can be difficult. As is stated elsewhere, we are trying to change the way that you think – sometimes this means you need a different perspective. This is where working with someone may prove useful. Study groups of 2 to 4 students meeting a couple of times a week seem to be effective. As many questions as you have, it is almost always the case that you can help someone else.

Office Hours:

It will take a few days to shake down everyone's schedule and get into a rhythm. Frankly, I don't get enough business during office hours, but boy do I hear the kvetching about how hard Physics is and how awful the Quizzes are. If my office hours are not convenient to your schedule, then it is up to you to make an appointment.

Physics is Phun:

No one ever believes that on the first day. And for some, it never is fun. But we can try! Really!

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. Active in the Michigan Section of the American Association of Physics Teachers (MIAAPT). For 2004-2005, Dr. Phil has a full-time faculty appointment as an Assistant Professor of Physics and Director of the WMU-STEP Program (to improve student retention in the Science, Technology, Engineering and Math majors). Dr. Phil pursues many science and science literacy efforts, and on the first day of class in

Spring 2005, he is on Day 2563 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 1383. No – it's not ready for you guys to read yet. After sending out twenty-eight short stories fifty-eight times, Dr. Phil has one story published in an anthology and two more slated for publishing this year. 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 last summer, so he is on his way to becoming a published science fiction author.

This is winter in Michigan – Land of Driving Adventures.
Dr. Phil has a long commute (154 miles/day) *and* Lake Michigan is a powerful force of nature.
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.

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

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?)

Everything's In The Syllabus

PHYS-115 (4) (Kaldon)

Chapter assignments are approximate – actual chapters will depend on our actual pace.

Week	Class Dates	Topic (Serway & Faughn – 6th ed.)	Special
1.	4,5,*6*,7 January	PART 4 - Electricity and Magnetism Ch. 15 - Electric Forces and…	Topic 1 Assigned *Quiz 1 (1/6)*
2.	10,*11*January 12,*13*,14 January	Ch. 15 (con't.) - … Electric Fields	*Quiz 2 (1/11), 3 (1/13)*
3.	**17 January** *18 January* 19,*20*,21 January	**MLK Day Convocation and Activities** Ch. 16 - Electrical Energy and Capacitance	*Quiz 4 (1/18), 5 (1/20)*
4.	24,*25*,26 January **27 January** 28 January	Ch.17 - Current and Resistance Ch.18 - D.C. Circuits	*Quiz 6 (1/25)* **Exam 1 (Ch. 15-16) - 1/27 Thu.**
5.	31January *1*,2,*3*,4 February	Ch. 19 - Magnetism	*Quiz 7 (2/1), 8 (2/3)*
6.	7,*8 February* 9,*10*,11 Feb.	Ch. 20 - Induced Voltage and Inductance	*Quiz 9 (2/8), 10 (2/10)*
7.	14,*15 February* 16,*17*,18 Feb.	Ch. 21 - A.C. Circuits and EM Waves PART 5 - Light and Optics Ch. 22 - Reflection and Refraction of Light	*Quiz 11 (2/15), 12 (2/17)*
8.	21,*22,23* February **24 February** **25 February**	Ch. 23 - Mirrors and Lenses **WMU Spirit Day, Spring Break Starts**	*Quiz 13 (2/22)* **Exam 2 (Ch. 17-21) – 2/24 Thu.**
9.	**28 Feb. - 4 March**	**Spring Break <No Classes All Week>**	
10.	7,*8 March* 9,*10*,11 March	Ch. 24 - Wave Optics	*Quiz 14 (3/8), 15 (3/10)*
11.	14,*15 March* 16,*17*,18 Mar.	Ch. 25 - Optical Instruments	*Quiz 16 (3/15), 17 (3/17)*
12.	21,*22 March* 23,*24*,25 Mar.	PART 6 - Modern Physics Ch. 26 - Relativity (Galilean, Einsteinian)	*Quiz 18 (3/22), 19 (3/24)*
13.	28,*29*,30 March **31 March** 1 April	Ch. 26 (con't.) - (Special Relativity and the Death of Simultaneity) Ch. 27 - Quantum Physics	*Quiz 20 (3/29)* **Exam 3 (Ch. 22-26) - 3/31 Thu.** Topic 1 due - 3/31 @ 5pm
14.	4,*5* April 6,*7*,8 April	Ch. 28 - Atomic Physics Ch. 29 - Nuclear Physics	*Quiz 21 (4/5)* *Quiz 22 (4/7)*
15.	11,*12 April* 13,*14*,15 April	Ch. 30 - Nuclear Energy and Elementary Particles **PHYS-115 Course Review (1 or 2 days)**	*Quiz 23 (4/12)* *Spare Quiz Slot (4/14)*
16.	**18-22 April**	**FINALS WEEK**	**Final Exam - 4/20 Wed. 2:45-4:45pm**
17.	*26 April*	*Grades Due on Tuesday at Noon*	