PHYSICS 201 SYLLABUS

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Course Content:

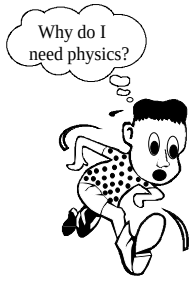
Required Text: *Fundamentals of Physics*, 8th Edition by Halliday, Resnick and Walker.

We will cover Chapters 1 through 20 of the text. You will learn about linear and circular motion, gravitational and frictional forces, rotational motion, work and energy, momentum, fluids, thermal physics, and wave motion. You are expected to take the lab, which will provide experience with physical concepts encountered in the lecture.

Finally, you are not expected to know all of calculus or have had physics before taking this class, though it is beneficial to have had either of these previously. MAT 161 is a corequisite for this class. The calculus concepts required for this course will be introduced as needed. In the case of summer school, you need to have taken calculus before enrolling in this class.

Why Study Physics?

This is a question that students often ask. "Why do I need to take physics? I am a biology major!" (You can fill in your own major.) To many physics appears to be a difficult subject, which is too abstract, not relevant to everyday living, and uses too much mathematics. It is the ultimate cross to bear to get an undergraduate degree. No wonder many students try to put it off as long as possible. However, there must be a good reason for other disciplines to require students to take this course.



There are several possible reasons to take physics. One is to open students' eyes to the wonders of the physical world around them. Another is to train them to analyze what they see by developing simple models of that part of the world in which they are interested. This last reason is called problem solving, which is a key ingredient in learning physics. Finally, the experience in this course will help in making the student a more informed individual, which can come in handy when basic issues in science become political issues.

What is physics? Physics is the most basic science. It touches every part of your daily life at every moment. It governs the heaters and air conditioners, which allow us to live in comfortable surroundings. It is responsible for the light used to read this syllabus, or to make it possible for cars to bring you to class. Without physics energy could not be transported in DNA molecules to allow biological systems to develop, grow and reproduce.

The word physics has its roots in the Latin word *physica* and the Greek word *physis*, which mean nature. Physics is the study of the underlying principles that govern the behavior of the world around us. It is important that everyone have some understanding of the physical world in our technological society.

We are faced with the accumulation of 7000 years of scientific information and with the internet our access to information is growing exponentially. However, there is still much that is unknown or not understood. New physical principles are being discovered every year in an attempt to refine our understanding of nature. Typically these result from a series of observations and experiments, which are complemented by reflective reasoning. Theories are then developed and tested, leading to new principles. This was described in the 1963 lectures of the late Dr. Feynman:

"What do we mean by understanding something? We can imagine that this complicated array of moving things which constitutes the world is something like a great chess game being played by the gods, and we are observers of the game. We do not know what the rules of the game are; all we are allowed to do is watch the playing. Of course, if we watch long enough, we may eventually catch on to a few of the rules. The rules of the game are what we mean by fundamental physics. Even if we know every rule, however, we might not be able to understand why a particular move is made in the game, merely because it is too complicated and our minds are limited. If you play chess you must know that it is easy to learn all the rules, and yet it is often hard to select the best move or to understand why a player moves as he does. So it is in nature, only much more so; but we may be able to at least to find all the rules. Actually, we do not have all the rules now. (Every once in a while something like castling is going on that we still do not understand.) Aside from not knowing all of the rules, what we really can explain in terms of those rules is very limited, because almost all situations are so enormously complicated that we cannot follow the plays of the game using the rules, much less tell what is going to happen next. We must, therefore, limit ourselves to the more basic question of the rules of the game. If we know the rules, we consider that we understand the world."

Study Tips:

To many students physics is difficult. Of course, this is true of any subject, which is not understood. The point is that physics can be understood through logic and objectivity. Physics is a subject, which builds on itself. Unfortunately, students must learn the basics, before they can venture to the more interesting applications. So, the subject may at first appear to be boring and not very relevant.

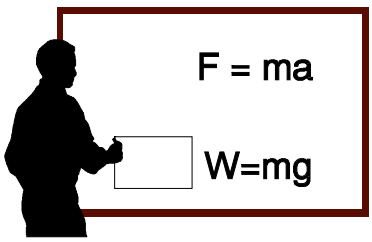
Another problem students face is that **the study of physics requires new terminology and a new way of thinking.** One cannot hope to learn physics the night before the exam. Therefore, in this course you will be expected to do homework assignments on a regular basis. In fact, you should spend several hours a day doing physics. **[You should spend at least four to six hours per day on physics outside of class!]**

A final discouragement to studying physics is the use of mathematics. Mathematics is a tool for expressing the observed relationships between physical quantities. **Physics is not mathematics.** The principles of physics can be stated without mathematics, but the mathematical equations express the physics compactly and can be used to predict the values of unknown quantities from known ones.

In a basic course, such as this one, we will practice using this tool by solving simple word problems. We will do this in the homework, in the lectures and in the exams. The key to doing word problems is the approach that one takes. In the following is a set of steps, which you should always follow to be successful:

SOLVING PROBLEMS

1. **Read the problem and determine the physical principle involved.**
2. **List the given and unknown information**
3. **Draw a picture, labeling it with the known and unknown information, when possible.**
4. **Write down any relationships between the given and the unknown variables.**
5. **Solve for the unknown quantities. Be careful to express everything in the appropriate units.**
6. **Express the answer with its units and the correct number of significant figures.**
7. **Final Check: Does the answer make sense?**



The goal of physics is to describe the maximum number of phenomena in our universe in terms of the minimum number of general principles. Also, these principles should be as simple as possible. Therefore, as you read the text and follow the lectures, you should get into the habit of identifying these principles. A suggested practice is as follows:

STUDYING PHYSICS

1. **Read the relevant text material before the lecture.**
2. **Go to class, takes notes, listen.**
3. **Reread the topic carefully. Identify the underlying principle of the section and/or chapter. Define all new terms. Understand the material, do not just memorize it.**
4. **Use the provided web materials, other course content and online videos.**
5. **Now, you are ready to start the problems and follow the problem solving strategy listed above.**

Bonus Work:

Unfortunately, at the conclusion of a two semester introductory physics course you will have seen only the physics known up to the early 1900s. However, in the past century physics has changed considerably. The neutron was discovered in 1932, followed by the discovery of many other elementary particles. In 1945 the first atomic bomb was exploded. In the 60's and 70's pulsars and other distant objects were observed. Lasers have become commonplace and the movies are filled with new technology and even things that are physically impossible. Or are they? Teleportation was common in Star Trek. In 1997 a group of scientists carried out a form of teleportation. More recently, we have learned that the universe expansion is accelerating and that there are such things as dark energy and dark matter.

In order to become familiar with these and other recent developments in physics, there will be periodic bonus questions handed out for extra credit. You will be required to answer these in essay form to receive credit. Only neat work will count! **Bonus points will be added to the quiz total points.**

Course Requirements:

Attendance: YOU ARE EXPECTED TO ATTEND ALL OF THE LECTURES! After three excused absences, there will be a penalty of 2% for each absence from your total grade.

Homework: Homework assignments will be handed out on a regular basis. They will not be collected, but you are strongly encouraged to do assignments before the quizzes are given. **Doing the suggested problems is very important for learning the material in this course**.

Labs: Satisfactory lab performance is a required part of this course. For each missed lab, your final grade will be dropped by half a letter grade according to departmental policy. There will be an opportunity to made up one lab at the end of the semeste. Labs will count 10% of your final grade.

Exams and Grades: There will be ten 25 minute quizzes and a final given in this course.***[That is about one every other day.]*** Quizzes will consist of a mixture of multiple choice, definitions or conceptual questions plus selected problems similar to those covered in class or in the Suggested Problem list. You will be tested on your grasp of the concepts and ability to use these concepts to solve problems.

All quizzes will be closed book and no formulae will be included. Makeup quizzes will be given at a set time to students who have obtained permission. No more than two quizzes can be made up. **Graphing calculators may not be used.**

The final exam will be cumulative, covering twenty chapters, and is to be given 11 am 2 pm on June 16th. Your grade will be based on the following information:

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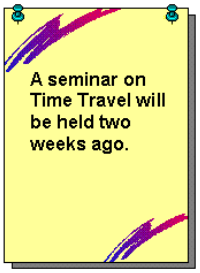
Quizzes	60%
Labs	10%
Final	30%

90-100	A
80-89.5	B
70-79.5	C
60-69.5	D

Plus-minus grading may be used in special cases.



Topics To Be Covered:

Basics Units, problem solving, trigonometry and vectors.

Kinematics Displacement, velocity, acceleration, free fall, projectile motion.

Linear Dynamics Newton's Laws of Motion, forces, gravitation, friction, work, energy, power, momentum, collisions and conservation laws.

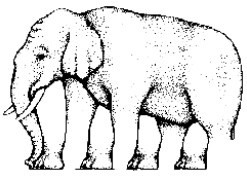
Rotational Dynamics Circular motion, angular velocity, angular acceleration, centripetal force, moment of inertia, torque, angular momentum, and rotational energy.

Matter in Bulk/Fluids Elasticity, simple harmonic motion, springs, pendula, density, pressure, buoyancy, fluid flow.

Thermodynamics Temperature, thermal expansion, phase changes, molecular motion, kinetic theory, gas laws, laws of thermodynamics, entropy.

Waves Wave motion, sound waves, Doppler Effect, linear superposition, interference, diffraction, standing waves.

Sometimes things are not as they appear.



Suggested Problems:

Doing and thinking about physics is important in learning the material. You should at least do the following problems in preparation for the quizzes and exams. Additional problems will be posted at the web site.

Date			Chap	Suggested Problems	Quizzes
May	15	R	1 2	5 7 14 19 20 2 3 5 11 14 16 18 21	
	16	F	2	26 29 30 35 38 44 49 67	
	19	M	3 4	1 2 4 8 13 17 23 28 1 4 5 8 11 18	x
	20	T	4	21 24 25 28 37 38 56 58 67	
	21	W	5	3 5 8 10 13 19 47 50 53 55 59	x
	22	R	6	4 7 16 17 20 25 29 41 43 45 58	

THIS SCHEDULE IS SUBJECT TO CHANGE

Physics on the Web:

More information will be posted on the web related to the topics we are studying. Links can be found with summaries to the material, study suggestions and links to videos in physics. Old quizzes will be made available, ideas for bonus topics and links to summaries of mathematical topics in algebra and trigonometry. These will be accessiblethrough the course homepage at

people.uncw.edu/hermanr/phy201/

Academic Honor Code: "The University of North Carolina Wilmington is committed to the proposition that the pursuit of truth requires the presence of honesty among all involved. It is therefore the institution's stated policy that no form of dishonesty among its faculty or students will be tolerated. Although all members of the university community are encouraged to report occurrences of dishonesty, each individual is principally responsible for his or her own honesty." Student Handbook.

(This includes plagiarism, bribery and cheating.)

Student Disabilities: UNCW Disability Services supplies information about disability law, documentation procedures and accommodations that can be found at http://www.uncw.edu/stuaff/disability/. To obtain accommodations the student should first contact Disability Services and present their documentation to the coordinator for review and verification.

Suggestions for Studying Physics*

Dale D. Long, Department of Physics, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061-0435

The chances are pretty good that you have heard a number of rumors about the perils of taking a physics course, and may already have experienced some of these trials and tribulations. I want to make a few suggestions that, I hope, will make your future study of physics more productive. And what's more, you might even find it fun.

You might have the impression that studying physics involves the memorizing of zillions of formulas, and then mastering the art of pulling the right formula out of the hat at the right time. Some physics courses, no doubt, are taught as if that were the case. However, the goal of physics is to describe the *maximum* number of things going on in our universe in terms of the *minimum* number of general principles. Furthermore, these principles should be as simple as possible. With that idea in mind, I want to suggest one general guideline to use throughout your study:

Try to identify the basic general principles, and look at the other ideas discussed as extensions and applications of these principles.

Do I read the textbook or do I study my notes?

In most physics courses, the primary source of your information is the textbook. The instructor is there to put the textbook material into perspective by amplifying, clarifying, demonstrating, and illustrating the ideas in the text. Your time in class will be spent best if you already have become moderately familiar with the material of the lesson by reading the appropriate sections of the textbook beforehand.

What about note-taking? Some students attempt to write down everything the instructor says or writes on the chalkboard. If that's helpful to you, then by all means do it! But I would like to suggest that sometimes you just stop taking notes, watch, and listen, especially if the concepts are covered in the textbook. If the instructor is explaining a complicated figure, doing a demonstration, or otherwise carrying out something hard to capture in notes, just try to absorb it as it is taking place. In this situation, the chances are your notes won't make any sense when you get home anyway, and the textbook will probably refresh you on what was done. Knowing when to take notes and when just to look and listen is something you'll have to learn from experience with each instructor. Your before-class study will help immensely with this problem.

General study procedure

Since every individual learns differently, feel free to modify these suggestions to suit your style. However, I urge you to give the following general guidelines, or something close to them, a serious try. They are listed in the suggested order of attack.

1. Before a topic is to be discussed in class, read the relevant textbook material seriously enough to get an introduction to the principles and the phenomena they describe.
2. After the class on that topic, carefully reread the appropriate sections of the textbook. "Carefully" means sentence by sentence, being sure that you understand sentence 93 before going on to sentence 94, for example. (There, of course, will be occasions when you'll need to move on and come back to that idea later.) Convince yourself that you understand the topic of the lesson before you even look at the assigned problems or questions. As you read the textbook, compare and study the corresponding topics in your class notes. When you come to an example in the text, before reading the solution give some thought to how *you* would answer the question or solve the problem. As you read over and study an important relationship, say the words that go with the symbols, not just the symbols. Verbalizing the words that are used for the quantities in a relationship helps to embed the meaning of that relationship in your brain.
3. Pay careful attention to the definitions of new terms in the chapter and learn them. Don't just memorize them, *understand* them! Some things can't be derived from simpler ideas; they are *defined* and you just have to remember them. If it's going to make any sense when the instructor or textbook uses these terms later, you need to know them.
4. After you have grasped the details of the chapter or topic, look back over the section and ask yourself: "What is the one primary thing this section/chapter is trying to tell me?" Once you have picked that out, look at the rest of the material as extensions or applications of that central idea.
5. Only after you feel that you have the best possible understanding of the physics principles in the chapter, go to your assigned questions and problems. Refer back to the text sections only as necessary, and to confirm that you indeed are proceeding correctly. This way, working problems and answering questions serve to solidify the principles in your mind. Remember that the problems are merely specific applications of the general principles, and it is those general principles that you need in order to understand a broad range of situations. In solving a problem, try to go back to the basic principle, and avoid "plugging into" some "formula" already derived for you. Don't forget to read, think about, discuss the qualitative questions, whether or not they are assigned. They help you to interpret and understand the meanings and applications of the principles.
6. Make a note of your questions and get them answered *right away*--by your instructor or another source of help. Failure to resolve a question merely results in more questions on subsequent topics.

When test/exam time comes, if you have followed the above procedures regularly and in step with the class schedule, you will need only to review the material briefly and refresh yourself on problem solving procedures.

Summary

As you study, remember that there are only a few basic principles that you need to know. It is a waste of your time and energy to clutter either your mind or your notecard with every equation in the textbook. There are only a few that are fundamental. They are the ones to understand thoroughly--both what they mean and how to apply them. In most textbooks, each chapter is centered around one or two main ideas. Work at picking them out and understanding them.

Distinguish derived results from definitions and assumptions. Learn the definitions of the terms being used. You cannot hope to understand a principle if you do not know the meaning of the words used in that principle.

Notice that I did not claim in the first paragraph that your study of physics would be easy. The program I have outlined is a rigorous one. But it is one that will make your course both satisfying to your intellect and rewarding at grade time.

These suggestions are published in **The Physics Teacher, Vol. 34, No. 3, March 1996, pp. 186-187.*