

Syllabus - PHYS 102N CONCEPTUAL PHYSICS II

9:30 – 10:45 a.m. -- Tuesdays and Thursdays -- OCNPS Room 0200

Simultaneous Enrollment in Lab is required (Labs on Wednesdays, starting first week!)

Course Website at <http://www.odu.edu/~skuhn/PHYS102/Home102.html>

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Web: <http://www.odu.edu/~skuhn/>
Office hours: Tuesdays 11:00 – 12:00 a.m. in the Physics Learning Center (lobby 2nd floor PSB II) and by appointment (just ask me after class, send email or call)

Required Material: Paul G. Hewitt, *Conceptual Physics*, 10th or 11th edition, Pearson/Addison Wesley, 2006. Comes with “Practicing Physics” companion and WebAssign access code (same book as 101).
Physics 102 Laboratory Manual, published by the Phys. Dept.
Interwrite PRS RF responses system (“RF clicker”) (same as 101)
Note: The new “TurningPoint” clickers will not work for our class.
WebAssign Access Code (comes with textbook, or directly from webassign.net). Students who took PHYS101 the previous semester can continue to use the **same** access code.

Optional Textbooks: Weinstein and Adam: “Guesstimation”, Princeton Univ. Press
Gonick and Huffman, “The Cartoon Guide to Physics”, Harper Perennial;
“Fear of Physics” (or any other book) by Lawrence Krauss;
“How Things Work: the Physics of Everyday Life” (and other books) by Louis Bloomfield; also check out popular books on Physics (B. Greene: “The elegant Universe”, etc.)

Prerequisites: Passing grade in PHYS101N. Some curiosity about the world around us, some familiarity with math and geometry.

Required Course Work: Lectures (very important, with quizzes that contribute to grade)
Laboratory - Attendance mandatory (up to 1 unexcused absence)
Homework, Tests and Final Exam

Grading Scheme:	Homework	20%
	In-Class Quizzes	10%
	Midterm Exams	20% (5% + 10% + 5%)
	Final Exam	30%
	Laboratory	20%

(Total grade of "F" for more than one unexcused absence)

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Introduction

This is the second semester of a two-semester course on the conceptual foundations (and the accumulated knowledge) of Physics: How do we describe observations? How do we *explain* what we observe? What unifying general principles govern everything that's going on in the Universe? What are the building blocks of Nature, and what forces act between them?

Topics to be covered include:

- Properties and dynamics of continuous matter
- Atoms, nuclei, particles
- Thermal phenomena – heat, temperature, phase changes, entropy
- Vibrations and Waves
- Sound
- Electromagnetism
- Light
- Relativity and Quantum Mechanics

The purpose of this course is to introduce you to some fundamental concepts of Physics which build the foundation of all of Science and Engineering. The "Scientific Method" consists in conducting systematic, reproducible experiments and observations, analyzing and organizing the results, abstracting the important parameters and observables, and finally constructing models and theories about their relationships that lead to testable predictions. Physics is the most rigorous and fundamental example of this method. In this course, we will learn how to perform measurements, describe the results in abstract terms, and compare them to the predictions of models and Laws of Physics. We will also learn how to use these Laws to examine new situations and predict the outcome of experiments (real or hypothetical - this is called "doing problems"). The power of Physics lies in the vast range of phenomena that can be explained, understood and **predicted** in terms of a relatively small collection of concepts and models.

We will try to minimize mathematical "obfuscation", but since Physics is a **quantitative** science, we will have to use at least some elementary math to arrive at interesting results.

Is this Course for YOU?

If you tend to faint at the sight of any mathematical equation, this course may not come easy. If you have too heavy a course load already and cannot commit substantial time and

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effort to this course, you may be disappointed by the outcome. You should have some curiosity about the natural world, some eagerness to do experiments (labs), and at least some mathematical background (high school level math and geometry). You should also have done reasonably well in PHYS101! If you think this applies to you, then this course should reward you with a deeper understanding of the world around you (not to mention a reasonable grade – but no guarantees!). In that case, this course is definitely for you! Note that you only have until the end of the first week of classes to withdraw with full tuition refund, and only one more week to withdraw with 1/2 tuition refund. It pays (literally) to figure out right away whether or not you plan to continue the course.

Some good advice

It is important for you to strive for an **active** understanding right from the beginning. This means that you should not just memorize random facts, but apply your new knowledge to solve problems. (Whether you are turning on the radio, fixing a plumbing problem or turning on the heater in your house, or looking at the sky, there are hundreds of occasions every day where you can observe Physics principles at work – try to spot them and think about how what you learned in this course might apply.)

Don't let things slip - it's much harder to catch up later! It is very important that you do the homework problems (apart from their contribution to the final grade). Since physics is a science based on observations it is also very important to do the laboratory experiments and to be well prepared for them.

Here are some ideas how you can get the most of the course:

- Go to the course website at <http://www.odu.edu/~skuhn/PHYS102/Home102.html> **often** and read all announcements, lecture notes, extra credit opportunities, etc.
- Come prepared: read up in the book on the topics to be discussed in the **coming** lecture. That way, you will already know what to expect, you can concentrate on the important concepts (instead of jotting down everything I say), and you can come up with questions you want to get answered in the lecture.
- Come to the lectures. They are not mandatory, but unless you are unusually bright (and have some extensive Physics background), you will not be able to separate the “really important” topics from the rest just by reading the book. Also, if you miss the lectures, you’ll miss the “clicker quizzes” which count towards the final grade.

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- Do the homework. Not only do you get credit for it, it is also the best preparation for the exams. For that reason, it is also a bad idea to mindlessly copy somebody else's homework (and it's against the law = honor code).
- If you need help, go to the Physics Learning Center – see below.
- Take the lab work seriously. Prepare ahead of time (at least read up in the book about the relevant concepts and read the lab manual) and try to do the experiments well (often there will be time to redo them with slightly different parameters). Of course, lab attendance is **mandatory** (you may not miss more than 1 lab unless you have a valid excuse - i.e., a medical emergency; otherwise **you fail the whole course**).
- Independent study: Try to do some extra problems (especially the “Review Questions”) from the book. Also work some problems in the companion book “Practicing Physics”. Check out some of the suggested alternative material (including on the Web). Meet with other students (form study groups of 2-4 people) to discuss the content of the lecture and exchange ideas. (You may **discuss** the homework with other students, but you may not copy their completed solution.) Go to the library and read up on the additional literature. Of course, you'll also have to review the material for the exams.
- Go to the office hours. The TA's and myself are glad to help you with any question (about Physics!) or get your feedback, and we are flexible when and where to meet.

Components of the Course

Lectures

The lectures (2 times 75 min. TR) will introduce and motivate new concepts. I will derive important results, demonstrate experiments and solve examples. Lectures are not strictly mandatory, but highly recommended. During about one lecture every week there will be a quiz given in class. These quizzes (as well as parts of the tests and exam) will require that you have a “RF clicker” to respond – make sure you buy one and set it up before class (see website for instructions)! The quizzes will test your understanding of the important concepts introduced that week, and will be graded. The combined results from these quizzes will make up 10% of your final grade.

Exams

There will be 3 midterm tests in class, and one 3-hour final exam (also in class) covering all of the material. The first and last test will be “clicker only” and count for 5% of the final grade; the 2nd midterm test will be a mix of clicker and written responses and count for 10%. Bring writing paper, pen and pencil (the latter only for diagrams!), a ruler and a

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calculator, **the clicker**, and a stapler. I will post a sheet of useful formulas that you should print and bring (so you don't have to memorize them in gory detail). No books, notes and other material may be brought to the exams. Make sure that you will be able to come at the scheduled exam times. As a rule, there won't be any "make-up" exams. In case of a sudden emergency, you may inform me (ahead of time if possible) and I will try to help you out (no guarantees). It is your responsibility to keep up with all deadlines. Make sure you follow the spirit and letter of the honor code!

Homework

Doing the homework problems is very important! They must be turned in through electronic submission via **WebAssign** (for details see the course web page – read all instructions carefully!). Homework due dates are firm – the system **can not** accept late homework. (The only exception are prolonged, documented medical problems - please contact me as soon as possible if this applies to you). You are responsible for logging in to WebAssign frequently to keep up-to-date on new postings, deadlines and any messages – **don't** wait until the last day! There is nothing wrong with doing the homework plenty ahead of time if you know you won't have time close to the deadline. Finally, you may miss one homework set and still receive full credit (100%) for the final grade (i.e. , your lowest homework grade - which could be zero - will be excluded from the final grade).

Numerical and multiple-choice answers will be graded immediately by WebAssign. Some exercises require a paragraph or two for an answer and will be graded later. Solve numerical problems first on a piece of paper so you know which steps and calculations will be involved – don't start by punching in numbers on your calculator or into WebAssign. Check your results – does the magnitude make sense? Check your units – no answer is complete without the proper units. Enter all calculations with at least 3 significant digits. WebAssign will automatically randomize some input values given, so no two students will have the same exact answer. Numerical problems can be submitted several times, but you have only one shot for the multiple-choice ones.

My interpretation of the **honor code** requires that all of you attempt your own solution to the homework problem sets. You may not copy or in any other way use the final or near-to-final results of a class mate (nor show yours to others). However, you may discuss the homework with your class mates and ask for hints, as long as you use only blackboards or other non-permanent means for writing.

Laboratory

All labs are on Wednesdays in room OCNPS 138. They are a very important part of the course. The topics treated here may sometimes occur a little bit earlier or later than in the

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lecture or require additional material, so it is important to come prepared. Also, bring all necessary items (calculators, graph paper, rulers, lab instructions etc.).

Please note the following rules:

- Read the assigned experiment(s) in the lab manual *before* the lab begins and bring all required items. On occasion pop quizzes are held to ensure that the students have read the assigned pages in the manual.
- **Attendance is mandatory – this includes the first week of classes.** You will **fail the whole course** if you miss more than one lab session unexcused. It is the responsibility of the students to inform their instructor of any absence and to arrange for a make-up of the work missed.
- The lab reports should be prepared according to the instructions/questions in the Physics 102 Lab Manual. In addition, your lab instructor will discuss the format for your lab reports and their grading procedure.

Learning Center

The Physics Learning Center, located in the second floor lobby of the new Physical Sciences Building (PSB II – adjacent to OCNPS), is a place where students can get together to work on their homework and get assistance, if needed, from physics faculty and grad students. No appointment is necessary! Students in any introductory class are encouraged to drop by the Learning Center for help on homework, lab, lecture, other course material, or just for a place to work while in the physics building. The Physics Learning Center will be open all week during normal business hours, and some evenings. Staff members will be on duty to help students for about 20 hours per week. A staffing schedule will be posted in the Center and on the web. Students are encouraged to use the room to work together on their assignments, even when a physics staff member is not available for tutoring. You can submit your solutions to WebAssign from the computers provided. I will be in the Learning Center every Tuesday after class. Please note: The Physics Learning Center will be open starting the second week of classes (after the Martin-Luther-King holiday).

Grades

Final grades will be computed from your grades in exams (20% for midterms and 30% for final), homework (20%), lecture quizzes (10%) and lab (20%). I do **not** “grade on a curve”, i.e. it is irrelevant for your own grade how well the others in the class are doing (everyone can get an A as far as I am concerned). As a rough estimate, you can assume that a score of 85% or better will translate into an “A” or “A-“, 70% - 85% into a B, 60% - 70% into a C and 50% - 60% into a D. Overall scores below that will mean that you fail

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the course. (These limits may seem rather generous, but you should also expect rather challenging problems on the exams!)

My interpretation of the Honor Code

- 1) I consider it advantageous if students discuss material and content of the lectures and homework problems with each other, and encourage that kind of cooperation.
 - You may pose questions about a problem to another student (as well as the TA's, myself and the Learning Center staff).
 - You may discuss verbally the content and methods of solution of a problem.
 - If you need to use writing to explain something to another student (or vice versa), use a blackboard or other clearly non-permanent means (scratch paper).
- 2) I consider it unethical and a violation of the honor code to simply use another student's solution or let somebody else solve the problem for you.
 - You **have** to contribute significant work to each problem yourself.
 - You need to make sure that you clearly understood every step of the solution. This is a useful test of whether getting outside help is allowed; I may use it to prove or disprove claims of unethical copying.
 - **All** written submissions must be prepared by yourself.
 - If you find the solution to a problem in a book or on the web, you must quote your source(s) and reformulate the solution in your own words (using the nomenclature and symbols introduced in class). If you copy an existing solution verbatim without attribution, you are violating the Honor Code.
- 3) You may not accept or give any help during exams, including the use of any written material other than the Formula sheet. However, you may ask me if anything is unclear!

In this context, I want to remind everyone of the **University policy**: Any official sanction for cheating, including the assignment of a grade of F for a quiz or for a course as a penalty for cheating, will appear on the student's permanent academic transcript! Any breach of the rules above will be considered to be "knowingly".

Finally, I direct your attention to the rules of "CCC" (College Classroom Conduct) published by the Office of Student Judicial Affairs. In particular, I will not condone interruptions of lectures by students receiving cell phone calls, entering or leaving during the allotted classroom time, or engaging in other distracting or disrespectful behavior. On the other hand, I strongly urge you to participate actively in the class by asking questions or answering my own ones, volunteering for experiments etc.

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			Approximate Schedule PHYS102		
Date	Day	Time	Topic	Pages	Lab [Wed, Room 138]
11-Jan	Tue	9:30 - 10:45	Introduction, Atomic Structure of Matter	210-217	Lab Intro - Mandatory
13-Jan	Thu	9:30 - 10:45	Nuclei, Atoms and Molecules	217-225	
18-Jan	Tue	9:30 - 10:45	Solids	229-237	EX01 Math Review
20-Jan	Thu	9:30 - 10:45	Fluids	248-260	
25-Jan	Tue	9:30 - 10:45	Gases	268-285	EP02
27-Jan	Thu	9:30 - 10:45	Temperature and Heat	290-301	Archimedes' Principle
1-Feb	Tue	9:30 - 10:45	Heat Transfer and Phases	306-337	EP03
3-Feb	Thu	9:30 - 10:45	<i>Extended Clicker Test/Midterm 1</i>		Specific Heat of a Metal
8-Feb	Tue	9:30 - 10:45	Thermodynamics	342-357	EP04
10-Feb	Thu	9:30 - 10:45	Vibrations + Waves	362-376	Latent Heat of Fusion
15-Feb	Tue	9:30 - 10:45	Sound	380-397	EP05
17-Feb	Thu	9:30 - 10:45	Music	398-405	Thermodynamics
22-Feb	Tue	9:30 - 10:45	<i>Refresher: Electromagnetism</i>	410-493	EP06
24-Feb	Thu	9:30 - 10:45	Electromagnetic Waves + Light	496-512	Harmonic Motion - Pendulum
1-Mar	Tue	9:30 - 10:45	Color and Optics	515-551	EP07
3-Mar	Thu	9:30 - 10:45	<i>Midterm (Test 2)</i>		Vibrating String
8-Mar	Tue	No class	<i>Spring Holiday</i>		NO LAB
10-Mar	Thu	No class	<i>Spring Holiday</i>		Spring Break
15-Mar	Tue	9:30 - 10:45	Light Waves: Refraction+Reflection	558 -	EP08
17-Mar	Thu	9:30 - 10:45	Light Waves: Interference and Diffraction	- 579	Harm. Motion - Mass on Spring
22-Mar	Tue	9:30 - 10:45	Light Emission and Absorption	582-596	EP09
24-Mar	Thu	9:30 - 10:45	Light Quanta and Matter Waves	600-615	Light and Color
29-Mar	Tue	9:30 - 10:45	Quantum Mechanics and Atoms	620-631	EP10
31-Mar	Thu	9:30 - 10:45	<i>Extended Clicker Test/Midterm 3</i>		Lenses and Mirrors
5-Apr	Tue	9:30 - 10:45	Nuclear Physics	634 -	EP11
7-Apr	Thu	9:30 - 10:45	Nuclear Physics	- 657	Spectrometry
12-Apr	Tue	9:30 - 10:45	Nuclear Fission and Fusion	661 - 681	EP12
14-Apr	Thu	9:30 - 10:45	Particle Physics		Refraction & Reflection
19-Apr	Tue	9:30 - 10:45	Special Relativity	686-715	
21-Apr	Thu	9:30 - 10:45	General Relativity and Cosmology	720-731	
26-Apr	Tue	9:30 - 10:45	<i>Review</i>	<i>extra</i>	
3-May	Tue	8:30 - 11:30	FINAL EXAM		

This schedule shows the approximate days in the semester when we will discuss certain concepts in lecture. The details may change, but the Labs, Exams and Holidays are firm.