PHYSICS 101N - Fall Semester 2009 - ODU

Syllabus - PHYS 101N ELEMENTARY PHYSICS

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/PHYS101/Home101.html

Instructor:	Dr. Sebastian E. Kuhn, Eminent Scholar & Professor of Physics Physical Sciences Building (PSB II), Room 2100J Phone: 683 – 5804 FAX: 683-5809 email: skuhn@odu.edu 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 edition, Pearson / Addison Wesley, 2006. Comes with "Practicing Physics" companion and WebAssign access code. ISBN-10: 032157804X *Physics 101 Laboratory Manual*, published by the Department of Physics. Interwrite PRS RF responses system ("RF clicker") from bookstore or Amazon.com (used is fine). WebAssign Access Code (included in new textbook packages).
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:	Some curiosity about the (natural and engineered) 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 first semester of a two-semester course on the conceptual foundations (and the accumulated knowledge) of Physics: How do we describe (motion of) objects? How do we *explain* motion (or rest)? 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:

- What is Physics? What is Science?
- What is the Universe made of?
- What interactions occur between the constituents of the Universe?
- Describing motion (Kinematics)
- Forces – their properties and their effects (Dynamics)
- Momentum and its conservation
- Energy – its different forms (kinetic, potential,…) and its conservation
- Rotation (angular velocity, angular momentum, centripetal acceleration, torque)
- Gravity, Projectile motion and satellite orbits
- Electrostatics
- Electric current and circuits
- Magnetism and magnetic induction

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 rigorous 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.

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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 effort to this course, you may be disappointed by the outcome. You should have some curiosity about the natural world, some willingness to do experiments (labs), and at least some mathematical background (high school level math and geometry). 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 driving your car, dropping a stone from a bridge or turning on the AC in hour house, 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/PHYS101/Home101.html **often** and read all announcements, lecture notes, and homework solutions.
- 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. Lecture notes will be posted but are not meant to substitute for attendance.

- 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 – I'll be there every Tuesday after class, and other staff will be there to help pretty much all the time.
- 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) *).
- 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 ask them for 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.

<u>Lectures</u>

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) 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 1 midterm exam of 75 minutes (10% of final grade) and 2 "extended clicker quizzes" (5% each) during regular class periods. We also have a 3-hour final exam (in our regular class room, but **not** during the regular class times (see University Exam Schedule) covering all of the material (30% of final grade). Bring the RF clicker (!), writing paper, pen and pencil (the latter only for diagrams!), a ruler and a calculator, and a stapler to all exams and tests. I have prepared a sheet of useful equations and facts (so you don't have to memorize them in gory detail) that you may print out and bring to the tests/exam (see website). No books, notes and other material may be brought to tests or 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, serious 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). Homework due dates are firm – I will not accept late homework. (The only exception are prolonged and serious 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 minute! 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 few sentences 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.

My interpretation of the **honor code** requires that all of you attempt their 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). For more see below.

Laboratory

All labs are on Wednesdays in room OCNPS 140. 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 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 to be missed.
- The lab reports should be prepared according to the instructions/questions in the Physics 101 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.

Grades

Final grades will be computed from your grades in exams (2x5% + 10% for extended clicker tests and midterm 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 80% or better will translate into an "A" or "A-", 65% - 80% into a B, 50% - 65% into a C and 40% - 50% into a D. Overall

scores below that will mean that you fail the course. (These limits may seem rather generous, but you should also expect rather challenging problems on the exams!)
You should keep track of your grades yourself – Webassign will report your current HW grade, and I will inform you of your test grades. If your grades are slipping, don't wait – get help immediately (make an appointment with me).

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) or ask for hints.
- 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.

Approximate Schedule PHYS 101

Date	Day	Time	Topic	Pages	Lab Experiments (Wed)
1-Sep	Tue	9:30 - 10:45	Introduction. What is Physics?	2 - 20	Lab Intro - **Mandatory**
3-Sep	Thu	9:30 - 10:45	Structure and History of the Universe	*extra*	
8-Sep	Tue	9:30 - 10:45	Newton's 1st Law - Inertia	21 - 40	EX01 Math Review
10-Sep	Thu	9:30 - 10:45	Linear Motion	41 - 46	
15-Sep	Tue	9:30 - 10:45	Free Fall	47 - 57	EX02 Velocity
17-Sep	Thu	9:30 - 10:45	Newton's 2nd Law	58 - 73	
22-Sep	Tue	9:30 - 10:45	Newton's 3rd Law	74 - 82	EX03 Acceleration
24-Sep	Thu	9:30 - 10:45	*Extended Clicker Test +* Vectors	82 - 90	
29-Sep	Tue	9:30 - 10:45	Momentum	91 - 97	EX04 Newton's 2nd Law
1-Oct	Thu	9:30 - 10:45	Collisions, momentum conservation	97 - 109	
6-Oct	Tue	9:30 - 10:45	Work and Energy	110 - 116	EX05 Friction
8-Oct	Thu	9:30 - 10:45	Energy conservation	117 - 130	
13-Oct	Tue	*No class*	*Fall Holiday*		*No Lab*
15-Oct	Thu	9:30 - 10:45	*TEST (Midterm I)*		
20-Oct	Tue	9:30 - 10:45	Rotational Motion	131-4,144-9	EX06 Resolution of Forces
22-Oct	Thu	9:30 - 10:45	Angular momentum	134-160 rest	
27-Oct	Tue	9:30 - 10:45	Gravity	161 - 168	EX07 Momentum
29-Oct	Thu	9:30 - 10:45	Solar system, Universe and Einstein	168 - 183	
3-Nov	Tue	9:30 - 10:45	Projectile Motion on Earth's surface	184 - 191	EX08 Projectile Motion
5-Nov	Thu	9:30 - 10:45	Satellite motion	192 - 208	
10-Nov	Tue	9:30 - 10:45	*Review + Extended Clicker Test*		EX09 Torque
12-Nov	Thu	9:30 - 10:45	Electricity	410 - 421	
17-Nov	Tue	9:30 - 10:45	Electrostatics	410 - 421	EX10 Rotation
19-Nov	Thu	9:30 - 10:45	Electric Field	421 - 435	
24-Nov	Tue	9:30 - 10:45	Electric Current	436 - 447	*No Lab*
26-Nov	Thu	*No class*	*Thanksgiving Holiday*		
1-Dec	Tue	9:30 - 10:45	Electric Circuits	448 - 457	EX11 Potential, Current &
3-Dec	Thu	9:30 - 10:45	Magnetism	458 - 466	Resistance
8-Dec	Tue	9:30 - 10:45	Magnetic Forces	466 - 476	EX12 Magnetic Force
10-Dec	Thu	9:30 - 10:45	*Review*	*extra*	
15-Dec	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.

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* Because of the potential severity of this year's flu season (H1N1 etc.), I strongly encourage all students to follow University policies and recommendations. In particular, if you have flu-like symptoms, please do **NOT** come to class or lab until you have been fever-free (< 100 F) for at least 24 hours (without using any medication like Aspirin© or Tylenol©). This means in most cases 4-5 days (according to the CDC)! I will make every effort to offer you make-up opportunities for any credit that you may have missed because you followed this advice. All I require is an email as soon as you know that you have to stay home, and another one once you are able to come back to class. If you have to stay away for more than 5 days (1 week of classes), I will need a physician's note.