

Syllabus - PHYS 101N CONCEPTUAL PHYSICS

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

Simultaneous Enrollment in one of the 3 PHYS101 Labs is required

Course Website at <http://www.odu.edu/~skuhn/PHYS101/Home101.html> and Blackboard (202110_PHYS101N_10010 CONCEPTUAL PHYSICS FALL)

Instructor: Dr. Sebastian E. Kuhn, Eminent Scholar & Professor of Physics
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Office hours: Tuesdays 2-3 p.m. (Learning Center OCNPS 214),
Thursdays 1:30 – 2:00 p.m. (my office), and by appointment
(just ask me after class, send email or call)

Required Material: Paul G. Hewitt, *Conceptual Physics*, 12th edition, Pearson 2015.

- *Physics 101 Laboratory Manual*, on Blackboard
- TurningPoint Response System – see <https://www.turning.com>
You **must** register and subscribe to TurningPoint to get credit for in-class quizzes – instructions are in a short video at <https://turningtechnologies-5.wistia.com/medias/nrmqd3cag9>

Optional Textbooks: Weinstein and Adam: “Guesstimation” and “Guesstimation 2.0”, 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%
	3 Midterm Exams	20% (5% - 10% - 5%)
	Final Exam	30%
	Laboratory	20% (Final grade of F for the lab portion yields an automatic F for the entire course)

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 objects and their motion? 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? How can we figure all this out?

Topics to be covered include:

- What is Physics? What is Science?
- What is the Universe made of?
- What interactions occur between the basic building blocks 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

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 unambiguous 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 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. 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 simply 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 your 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 out of the course:

- Go to the alternate course web page at <http://www.odu.edu/~skuhn/PHYS101/Home101.html> and our **Blackboard site** **often** and read all announcements, lecture notes, etc. It is **your** obligation to be aware of all test dates and deadlines, and to be on time for them.
- 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 already 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, this is also the best preparation for the exams. For that reason, it is also a bad idea to copy somebody else's homework (and it's against the law = honor code). Solutions will be posted after the due dates – make sure you study them so you can improve your understanding.
- If you need help, go to the **Physics Learning Center** (see below), my office hours or the Lab TA's office hours, or make an appointment to talk with me one-on-one.
- 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 2 labs unless you have a valid excuse - i.e., a medical emergency – **and** make up any missed labs). Failing the lab means **you fail the entire course**.
- Independent study: Try to do some extra problems (especially the “Check Yourself” and “Reading Check Questions”) from the book. 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. Also review the material for each exam, using the posted Exam Formula Sheet.

Components of the Course

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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 at least 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 use the Turning Point app or web interface to respond – make sure you are subscribed and set up before class (see Blackboard / 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 third test will be shorter and count for 5% of the final grade and will use the TurningPoint Response system; the 2nd midterm test will require written responses and count for 10%. I will post a sheet of useful formulas that you should print (so you don't have to memorize them in gory detail). Other than that, **no** books, notes and other material may be used during any tests or exams. **Make sure that you will be able to take the tests/exams at the scheduled times.** As a rule, there won't be any "make-up" exams. In case of a true emergency, you may inform me (ahead of time if possible) and I will try to help you. 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 – this is how you learn the material! A homework solution is **not** complete unless you write down a **detailed** explanation for your answer (complete sentences).

Homework must be submitted through the Blackboard interface! This means you must convert your solutions into machine-readable form – MS Word, .pdf file, etc. If you **must**, you can write your solution by hand (neatly, on white paper!) and scan it (use a scanner or a dedicated scanning app, **not** a photo), then submit the scanned file as .pdf. Problems are scored by humans – unclear submissions will get 0 points!

You must do the work yourself – looking up solutions on the internet or copying from your classmates is not allowed **and** you will not learn anything. Homework due dates are firm – I **will not** accept late homework, including for technical reasons. (The only exception is a true emergency - please contact me as soon as possible if this applies to you). The deadlines are very generous (midnight the day the HW is due) but **don't** wait until the last moment! I strongly encourage you to do the homework plenty ahead of time to avoid last-minute technical problems - there is nothing wrong with submitting HW a day or 2 early! You are responsible for logging in to Blackboard frequently to keep up to date

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on new postings, deadlines and any messages. 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).

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. 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.

My interpretation of the **honor code** requires that all of you submit 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 classmate (nor show yours to others). However, you may discuss the homework with your classmates and ask for hints (scrap paper or whiteboard only).

Laboratory

All Labs are Mondays and are **mandatory**. If you miss more than 2 labs unexcused, you will receive an “F” in the Lab. Furthermore, an “F” in the Lab automatically results in an “F” for the entire course! You **can** make up (only!) excused absences. Note that the first lab will be during the first week of classes, before we had our first class meeting! More information is on the companion Blackboard site for the course 202110_PHYS101N_10011 CONCEPTUAL PHYSICS LAB.

Grades

Final grades will be computed from your grades in exams (20% for all midterms combined 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 the course. (These limits may seem rather generous, but you should also expect rather challenging problems on the exams!)

Tutoring

You can find a wide range of resources for students at <https://www.odu.edu/success>. The Physics Learning Center, located in the **MSRC Chemistry and PLC Tutoring Center***) in **OCNPS 214**, is a place where students can get together to work on their home-

*) The [Math & Science Resource Center](#) (MSRC) offers free tutoring for certain Biology, Chemistry, Computer Science, Mathematics and Psychology courses. We are dedicated to helping students succeed by offering more than one way to connect with a tutor. We offer online & in-person tutoring by appointment as well as drop-in tutoring (no appointment necessary). **Online Tutoring Appointments** are made via Retain and students can access this service by clicking the following link: <https://odu.retain.io/> Online tutoring hours vary Sunday-Thursday from 8:00 am-9:00 pm

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work 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. See odu.edu/physics/students/learning-center. I will be present as a tutor Tuesdays from 2 to 3 p.m.

Note: you can find a wide range of other relevant resources at the ODU portal <https://portal.odu.edu>, including the “Retain” platform https://app.retain.io/users/sign_in.

Accommodation Statement

Students are encouraged to self-disclose disabilities that have been verified by the Office of Educational Accessibility by providing Accommodation Letters to their instructors early in the semester in order to start receiving accommodations. Accommodations will not be made until the Accommodation Letters are provided to instructors each semester.

Also please take note of the following:

ODU’s Office of Counseling Services (OCS, 1526 Webb University Center) is a university agency with competent, diverse, and multidisciplinary professional staff. We are committed to supporting the emotional well-being, social development, and academic progress of all students at Old Dominion University.

College life can be a wonderful time of self-discovery, but for many, it is also a time when the awareness of mental health conditions increases. OCS services are available to assist with addressing mental health concerns that a student may be experiencing. You can learn more about the broad range of confidential mental health services available on campus via our website at <http://www.odu.edu/counselingservices>. All services are free to ODU students. See also <https://www.odu.edu/life/health-safety/health/counseling/thrive> and <https://www.odu.edu/life/dean-students/student-outreach> (ODU CARES).

Cultural Diversity

Old Dominion University fosters a campus community that values and supports the cultural identities of each of our members. The University also fosters an inclusive environment and provides programs that cultivate a climate of awareness, understanding, and respect of diverse individuals and groups. [Source: Adapted from <https://www.odu.edu/oir>]

COVID-19 Guidance

Please follow all of the University requirements and advice regarding the mitigation of the spread of the Coronavirus. Information can be found at odu.edu/covid-19. Students

must wear masks inside the classroom at all times (except when drinking), and they must be vaccinated unless explicitly exempted and getting a weekly (negative) COVID-19 test.

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 black/whiteboard 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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Schedule

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.

Approximate Schedule PHYS101						
Date	Day	Time	Topic	Pages	HW due	Lab [Mondays]
31-Aug	Tue	9:30 - 10:45	Introduction: What is Science? What is Physics?	2 - 18		Lab Introduction + EX01
2-Sep	Thu	9:30 - 10:45	Newton's 1st Law - Inertia; Forces	21 - 38		Measurements and Uncertainty
7-Sep	Tue	9:30 - 10:45	Linear Motion	40 - 43	HW 1	NO LAB
9-Sep	Thu	9:30 - 10:45	Constant Acceleration and Free Fall	43 - 56		
14-Sep	Tue	9:30 - 10:45	Newton's 2nd Law	58 - 73	HW 2	EX02
16-Sep	Thu	9:30 - 10:45	Newton's 3rd Law - Reaction	74 - 89		Velocity and Acceleration
21-Sep	Tue	9:30 - 10:45	<i>Midterm (Test 1)</i>			EX03
23-Sep	Thu	9:30 - 10:45	Momentum	90 - 96	HW 3	Gravity
28-Sep	Tue	9:30 - 10:45	Collisions and Momentum Conservation	97 - 108		EX04
30-Sep	Thu	9:30 - 10:45	Work and Energy	110 - 117	HW 4	Projectile Motion
5-Oct	Tue	9:30 - 10:45	Energy conservation	117 - 131		EX05
7-Oct	Thu	9:30 - 10:45	Rotational Motion	132 - 149	HW 5	Newton's Laws
12-Oct	Tue	9:30 - 10:45	<i>Fall Holiday</i>			NO LAB
14-Oct	Thu	9:30 - 10:45	Angular Momentum	150 - 159		
19-Oct	Tue	9:30 - 10:45	<i>Midterm (Test 2)</i>			EX01-05
21-Oct	Thu	9:30 - 10:45	Gravity	160 -	HW 6	Make-up labs
26-Oct	Tue	9:30 - 10:45	Solar System and the Universe	- 181		EX06
28-Oct	Thu	9:30 - 10:45	Projectile Motion on Earth's surface	182 -	HW 7	Friction
2-Nov	Tue	9:30 - 10:45	<i>Election Day Holiday</i>			EX07
4-Nov	Thu	9:30 - 10:45	Satellite Motion	- 206		Rotational Motion
9-Nov	Tue	9:30 - 10:45	Electricity	406 -	HW 8	EX08
11-Nov	Thu	9:30 - 10:45	Electrostatics	- 417		Electrostatics
16-Nov	Tue	9:30 - 10:45	<i>Midterm (Test 3)</i>			EX09
18-Nov	Thu	9:30 - 10:45	Electric Field	417 - 429	HW 9	Circuits
23-Nov	Tue	9:30 - 10:45	Electric Current	430 - 441		NO LAB
25-Nov	Thu	9:30 - 10:45	<i>Thanksgiving Holiday</i>			
30-Nov	Tue	9:30 - 10:45	Electric Circuits	441 - 451	HW 10	EX10
2-Dec	Thu	9:30 - 10:45	Magnetism	452 - 460		Magnetism
7-Dec	Tue	9:30 - 10:45	Magnetic Forces	460 - 468		EX06-10
9-Dec	Thu	9:30 - 10:45	<i>Review</i>		HW 11	Make-up labs
14-Dec	Tue	8:30 - 11:30	FINAL EXAM			NO LAB