

PHYSICS 102N - Spring Semester 2022 - ODU

**Syllabus - PHYS 102N CONCEPTUAL PHYSICS II CRN 20108**

9:30 – 10:45 a.m. - Tuesdays and Thursdays - OCNPS Room 0200  
Simultaneous Enrollment in Lab required (Labs on Mondays)

See separate Blackboard site for the Lab for further information!

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

Instructor: Dr. Sebastian E. Kuhn, Eminent Scholar & Professor of Physics  
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Web: <http://www.odu.edu/~skuhn/>  
Office hours: Mondays 11:00 – 12:00 a.m. in my office or via  
Zoom and by appointment (ask me after class, send email or call)

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Required Material: Paul G. Hewitt, *Conceptual Physics*, 12<sup>th</sup> edition, Pearson, 2015.  
ISBN 9780321909107  
*Physics 102 Laboratory Manual*, published by the Phys. Dept. on  
the Lab Blackboard Page  
TurningPoint Response System (same as 101!) – see  
<https://www.turningtechnologies.com/turningpoint-app/>

Optional Textbooks: Weinstein and Adam: “Guesstimation” and “Guesstimation 2.0”,  
Princeton Univ. Press. Gonick & Huffman, “The Cartoon Guide to  
Physics”, Harper Perennial; “Fear of Physics” (or any other book)  
by Lawrence Krauss; “How Things Work: The Physics of Every-  
day Life” (and other books) by Louis Bloomfield; also check out  
popular books on Physics (B. Greene: “The elegant Universe”...)

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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

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Grading Scheme:

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

**(Total grade of "F" for a Lab grade below 60% - no exception)**

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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. 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

### 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 (I recommend at least 10 hours per week) and effort to this course, you may be disappointed by the outcome. You should have some curiosity about the natural world, eagerness to learn from 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 beginning of the second 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 this course is for you.

### Some good advice

It is important for you to strive for an **active** understanding right from the beginning. This means that you should not 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.)

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**Don't let things slip** - it's much harder to catch up later! Expect to spend at least 10 hours every week on this class. 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. EMAIL ME IF YOU HAVE ANY QUESTIONS!

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

- Visit the course Blackboard website **AND** <http://www.odu.edu/~skuhn/PHYS102/Home102.html> often and read all announcements, lecture notes, upcoming HW problems, etc.
- Come prepared: read up in the book or the posted lecture notes 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 (in-class only). 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. (Responding to clicker quizzes remotely is only an emergency solution of you have to miss class for a valid reason – not as a standard way to get the same credit).
- 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 simply 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 – or my office hours.
- 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. 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.

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### 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 use the Turning Point app or web interface to respond – make sure you are subscribed and set 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 self-paced clicker quizzes and count for 5% of the final grade; the 2<sup>nd</sup> 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). 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 sudden 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 (i.e., a violation of the Honor Code and the ODU policy on academic integrity), **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 dead-

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lines 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 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). **If I find that your solution is an exact word-by-word copy of another student's solution**, I may have no choice but refer **both of you** under the University's policy on academic integrity - <https://www.odu.edu/about/monarchcitizenship/academic-integrity> .

### Laboratory

All labs are on Mondays. They are a very important part of the course. See the Laboratory Schedule and Laboratory Syllabus on Blackboard for details. Labs start the **SECOND** week of class. Students who fail the laboratory will fail the entire course. Attendance is mandatory.

### 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 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>.

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The Physics Learning Center, located in the **MSRC Chemistry and PLC Tutoring Center<sup>\*)</sup> in OCNPS 214**, 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. See [odu.edu/physics/students/learning-center](https://odu.edu/physics/students/learning-center).

**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](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).

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<sup>\*)</sup> 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

### **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](https://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 (=cheating).
  - 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 (= plagiarism), you are violating the Honor Code.
- 3) You may not accept **nor 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!

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In this context, I want to remind everyone of the **University policy** (see <https://www.odu.edu/about/monarchcitizenship/academic-integrity>): Any official sanction for cheating, including the assignment of a grade of F for a quiz, an assignment or for a course as a penalty for cheating or plagiarism, 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 – see <https://www.odu.edu/content/dam/odu/offices/bov/policies/1500/BOV1530.pdf>). 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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The following schedule shows the approximate days in the semester when we will discuss certain concepts in lecture. The details may change, but Exams and Holidays are firm.

Approximate Schedule PHYS102						
Date	Day	Time	Topic	Pages	HW	Lab [Mondays 9:00]
11-Jan	Tue	9:30 - 10:45	<i>Introduction</i> , Atomic Structure of Matter	208 -		Lab Introduction (Mandatory)
13-Jan	Thu	9:30 - 10:45	Nuclei, Atoms and Molecules	221		
18-Jan	Tue	9:30 - 10:45	Solids	226 - 243	HW 1 due	NO LAB - Martin Luther King
20-Jan	Thu	9:30 - 10:45	Fluids	244 - 263		
25-Jan	Tue	9:30 - 10:45	Gases	264 - 281	HW 2 due	EP01
27-Jan	Thu	9:30 - 10:45	Temperature and Heat	284 - 301		Characteristics of Matter
1-Feb	Tue	9:30 - 10:45	Heat Transfer and Phases	302 - 335	HW 3 due	EP02
3-Feb	Thu	9:30 - 10:45	<i>Midterm (Test 1)</i>			Archimede's Principle
8-Feb	Tue	9:30 - 10:45	Thermodynamics	336 - 353		EP03
10-Feb	Thu	9:30 - 10:45	Vibrations + Waves	356 - 373	HW 4 due	Specific Heat and Latent Heat
15-Feb	Tue	9:30 - 10:45	Sound	374 - 390		EP04
17-Feb	Thu	9:30 - 10:45	Music	391 - 403	HW 5 due	Thermodynamics
22-Feb	Tue	9:30 - 10:45	Electromagnetic Waves + Light	469 - 490		EP05
24-Feb	Thu	9:30 - 10:45	Color and Light Rays	491 - 518	HW 6 due	The Pendulum
1-Mar	Tue	9:30 - 10:45	Light Waves: Refraction+Reflection	519 - 543		Make-up Labs 1-5
3-Mar	Thu	9:30 - 10:45	<i>Midterm (Test 2)</i>			
8-Mar			<i>No Classes - Spring Holiday</i>			NO LAB
10-Mar						
15-Mar	Tue	9:30 - 10:45	Light Waves: Interference and Diffraction	544 - 561		EP06
17-Mar	Thu	9:30 - 10:45	Light Emission and Absorption	562 - 581	HW 7 due	Waves
22-Mar	Tue	9:30 - 10:45	Light Quanta and Matter Waves	582 - 599		EP07
24-Mar	Thu	9:30 - 10:45	Quantum Mechanics and Atoms	602 -	HW 8 due	Sound
29-Mar	Tue	9:30 - 10:45	Quantum Mechanics and Atoms	-614		EP08
31-Mar	Thu	9:30 - 10:45	<i>Midterm (Test 3)</i>			Refraction & Reflection
5-Apr	Tue	9:30 - 10:45	Nuclear Physics	616 -	HW 9 due	EP09
7-Apr	Thu	9:30 - 10:45	Nuclear Physics	- 636		Spectroscopy
12-Apr	Tue	9:30 - 10:45	Nuclear Fission and Fusion	637 - 656	HW 10 due	EP10
14-Apr	Thu	9:30 - 10:45	Particle Physics			Radioactivity
19-Apr	Tue	9:30 - 10:45	Special Relativity	657 - 685		Make-up Labs 6-10
21-Apr	Thu	9:30 - 10:45	REVIEW		HW 11 due	
26-Apr	Tue	9:30 - 10:45	<i>READING DAY - NO CLASS</i>			NO LAB
28-Apr	Thu	8:30 - 11:30	FINAL EXAM			