About Physics 141H

PHYS 141H. Honors: Elementary General Physics I (5 cr) Lec 4, lab 3. Prereq: Good standing in the University Honors program or by invitation; MATH 102 or equivalent. Credit toward the degree may be earned in only one of: PHYS 141, 141H, and 151. Lab fee required. Topics covered include Mechanics, Heat, Waves, and Sound.

Lecture: Meets Mondays and Wednesdays from 12:30 PM to 2:20 PM in JH 145.

This is an introductory science course intended for students majoring in biological sciences, pre-health sciences, and related programs. It is a quantitative course focused on recognizing, analyzing and solving problems involving physical principles and situations as a means of gaining greater insight into and understanding of the principles and process that govern the world around us. We will examine on the evidence upon which scientists base their theories, and the methods with which they make predictions and test them. Some of the content and activities connected with the course is available only online and access to an active internet connection will be required.

It is often said that the *language of science is mathematics*. This is indeed the case, to an extent, since key concepts and principles are most precisely articulated mathematically and the construction and manipulation of mathematical models is at the core of doing science. Therefore, it is essential that you have as a foundation the knowledge and skill with mathematical topics covered by MATH 102, especially the following topics: Arithmetic; Measurement and Units; Scientific Notation; Significant Digits; Algebra; Exponentials and Logarithms; Geometry; Trigonometry; and Vectors. These topics are summarized in Appendices A & B of the Required Textbook. Although Calculus is not required, it will help you to better appreciate the mathematics presented.

About the Instructor

Your Instructor, Stephen Ducharme, has been a member of the UNL faculty since Harold V became King of Norway. Ducharme leads a Research Team working with Molecular Electronics and teaches Astronomy and Physics courses. He is devoted to Nanoscience Outreach and Education and to improving Science Education. He also likes to Race Sports Cars.

Instructor: Stephen Ducharme, Professor
Department of Physics & Astronomy
Nebraska Center for Materials and Nanoscience
University of Nebraska-Lincoln

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Zoom: https://unl.zoom.us/my/spducharme
Home Page, Calendar

Class Times: MWF 12:30 to 2:20 PM
Meets in JH 145 (map)

Getting Help: Office JH 310F (map)

Office Hours: Hours: MW at 10:30 am; TR 9:30 am

Appointments or drop-in help available at other times.

I am generally available from 9:00 AM to 6:00 PM, although I have meetings and appointments scattered throughout the week. Please check my Calendar first.

You are also welcome to contact my by email after hours and on weekends, but it may take me longer to respond.

You can get help at the physics resource and tutoring center.

eTextBook and Course Materials

eTextbook Required: Instead of a printed textbook, we will be using an interactive eTextbook and learning system called WileyPLUS that integrates directly into Canvas.

> *Physics*, *11th edition*, by Cutnell and Johnson; ISBN: 9781119672081

If you want a printed copy choose the eText plus loose-leaf printed version bundle (ISBN: 9781119672050). To purchase the text, follow the instructions in the following video.

> **Accessing your WilePLUS Course and eTextbook (https://players.brightcove.net/4931690914001/default_default/index.html?videoId=6177746485001)**

Once you have purchased the WileyPLUS eTextbook, you may access it offline using the free VitalSource BookShelf app. This will allow you to download a fully functional eTextbook and work with it offline. Any notes or highlighting that you save in the eTextbook will be copied to both the online version and the VitalSource version.

iClicker or Reef account *Required* to use the student response system in class.

Other *Required* Supplies: A pen or pencil, ruler and a protractor, and a scientific calculator will all be needed to complete some of in-class exercises.

General Policies

Style of Instruction: The design and execution of this course is based on the principle of "student-centered learning", which recognizes that learning best arises from student engagement with the subject, with peers, and with instructors. While there will be some lecturing, research shows just listening to a lecture is a poor way to gain deep understanding and retention of scientific concepts. Instead, you must engage with the material through "hands-on" practice of the content, and that learning from and explaining your understanding to your peers is extremely valuable. Your instructor has the responsibility of putting things in context and guiding you through the learning process, but the ultimate responsibility for learning the content falls on the student. Thus this course is structured as follows.

Time Commitment: Expect to spend 6 to 12 hours per week outside of class on reading and class preparation, preclass quizzes, follow-up study, homework, and other tasks as recommended or assigned.

Attendance and Participation: In order to satisfy the structure for this course, you are expected to attend every class to engage in the material. Since much of the learning will be accomplished in class by interacting with peers, your attendance and participation is essential to the success of the entire class. For synchronous activities (scheduled class and lab times): arrive in the classroom or connect on Zoom as appropriate and be ready to work when class begins; be fully engaged and participate in all activities so that you *and* your classmates may obtain the full benefit of the class, stay engaged until class is dismissed.

Assignment Deadline Policies: You are responsible for following the calendar and deadlines by viewing all *required online materials* assigned before class and and completing all assignments on time. No late work will be accepted. Exceptions *may* be made at the instructor's discretion for unavoidable, reasons (e.g., illness or family emergency), provided you request this from your instructor in writing with full documentation as soon as possible, but no later than 48 hours after you are able to return to classes.

Technology Policies:

- You will need access to a personal computer with internet access sufficient bandwidth to handle videos and Zoom meetings.
- Check Canvas regularly, at least once per day, for schedules and announcements. If I have an important message to send you between classes, I will use the Canvas Email system, so please make sure that the email address that it has for you is current and that you check that email address regularly.
- Cell phone use is strictly prohibited during synchronous activities (class and lab times). Turn of your ringer and other audible alerts.

- Stay focused on the class. This means that you have only class-related apps and browser windows on your screen.

Instructor Discretion Policy: Exceptions to course policies will be made at the instructor's discretion without waiving the right to enforce those policies at a later date. For example, if the instructor accepts a late assignment from a student in any instance, that does not mean that this exception will be granted to another student or at another instance. Your instructor pledges to make all exceptions as fairly as possible, but they are still at the instructor's discretion.

Academic Integrity and Honesty: Academic Integrity and Honesty is essential to the existence and integrity of an academic institution. The responsibility for maintaining that integrity is shared by all members of the academic community. The University's **Student Code of Conduct (https://studentconduct.unl.edu/student-code-conduct)** addresses academic dishonesty. Students who commit acts of academic dishonesty are subject to disciplinary action and are granted due process and the right to appeal any decision.

Class Conduct Policies: Some aspects of expected behavior during class time were covered above, but I will reiterate that I expect you to come to class prepared to learn, and that you foster a positive learning environment for yourself and your fellow students. Please participate actively in group and class cooperative activities, and please remain silent when appropriate. Please be respectful of everyone in both your language and conduct. That respect includes both personal respect and creating the proper classroom environment. If you need to visit the restroom, you do not need to seek permission, just leave quietly and return quietly as soon as you can.

Copyright, Intellectual Property, and Confidentiality: All course materials, assessments, videos, communications, and other materials provided in this course are copyrighted and are the intellectual property of the original publisher, instructional staff, or the University of Nebraska and should not be disseminated or in print or electronically unless in compliance with applicable law and with appropriate attribution to the source. All classes are closed to the Press/Media. No video or audio taping of class sessions is allowed unless you obtain my permission to do so. The instructor will record the parts of the synchronous class sessions and make them available to Canvas so that you may review them at your leisure. In addition, to protect the privacy of class members and instructional staff, the products of this course, such as student assignments, online discussions, and recordings are considered confidential and may not be disseminated outside the class members. This doesn't mean that what we do is necessarily secret, but mainly that some of these products, especially recordings and videos, identify individual class members who should have the reasonable expectation of privacy outside of the class.

See also the **University-Wide General Course Policies and Resources (https://executivevc.unl.edu/academic-excellence/teaching-resources/course-policies)** .

Assessment and Grades

PreClass Quizzes: The PreClass quizzes provide a measure of your preparation for class and provide feedback to the instructor. They are designed around the method of "Just-In-Time Teaching," which is a widely used, scientifically tested, method for informing the instructor about student readiness just prior to class. PreClass quizzes must be completed by 9:00 AM the day class meets.

Participation: Participation will be assessed according to contributions to general discussions, iClicker activity, class exercises, and group exercises.

Projects: You will complete two short "projects" related to the class content. These are not term papers or lengthy semester-long projects, but are opportunities for you to have a unique learning experience that suits your interests and talents.

Tests: There will be three one-hour Tests in class on dates given in the **Course Schedule (https://canvas.unl.edu/courses/140980/pages/schedule)** . The Tests will be closed book, with an equation sheet supplied by the instructor. There is no separate final exam.

Laboratory: You must register for and attend a weekly Physics 141 laboratory section.

Final Grade: The final letter grades, including +'s and −'s, will be determined at the end of class. However, it is reasonable to expect that it will be very similar to the ranges listed above. Your grade will depend on your work and your performance in the class, and not based on a "scale" or other measure relative to your peers. Since this is an Honors class, you will be expected to work at a higher level than a regular section, but your grade will be determined based on the expectations of the general Physics 141 class.

Item	**Fraction of Grade**
Tests	45%
PreClass Assignments	10%
Participation	5%
Home Work	15%
Projects	10%
Laboratory	15%
Total	**100%**
Grade	**Points Earned**
Some type of A	≥ 85%
Some type of B	≥ 75%
Some type of C	≥ 65%
Some type of D	≥ 55%

ACE Information

(i) the ACE Outcome(s) for which the course is certified

Student Learning Objective 4 (SLO 4): Use scientific methods and knowledge of the natural and physical world to address problems through inquiry, interpretation, analysis, and the making of inferences from data, to determine whether conclusions or solutions are reasonable.

(ii) the opportunities the course will give students to acquire the knowledge or skills necessary to achieve the Learning Outcome(s)

Mathematics and Statistics

The course makes extensive use of mathematical analysis as a central and essential component of estimation, problem solving, and evaluation of solutions. The mathematical methods most used are algebra, trigonometry, vectors, unit analysis, and numerical computation.

Critical Thinking

The course emphasizes the development of mature appraisal and problem solving techniques, which involve C**ritical Thinking** at three key stages. First, in setting up the analysis, students must learn to identify the essential physical principles and to which part of the system or process they apply. Second, in developing the solution, the students must identify useful and valid assumptions about how the system should behave, and relate this to the mathematical representation of the solution. Third, the students must evaluate and test the solution for reasonableness and accuracy. This is particularly important when they are working with phenomena, such as the behavior of subatomic particles, that are not part of everyday experience, or the validity of assumptions and approximations, such as the neglect of friction when its effects have insignificant influence on the outcome. Even in the case of everyday experience, the must learn to challenge their own, frequently flawed, preexisting conceptions.

Problem Solving

Problem solving is by far the main activity in the course. Therefore most of the effort in the course is focused on the process and tools for solving problems involving physical systems.

(iii) the graded assignments which the instructor(s) will use to assess the student' achievement of the Outcome(s).

Student abilities for appraising physical situations is assessed in several ways. The course grade is based on a cumulative score that is derived from the following components, which are all graded and weighted according to the breakdown given in the syllabus. For each lecture assessment activities include student responses to (i) pre-class quizzes, (ii) in-class exercises, and (iii) follow-up homework exercises and problems. For the weekly laboratory sessions, students are assessed based on vi) lab-preparation quizzes and vii) a report of the results, analysis, and conclusions drawn from the laboratory results. Progress in the course as a whole is assessed with (viii) unit midterm exams. The pre-class quizzes, concept questions, and some of the homework exercises focus on specific

knowledge, basic computational skills, and grasp of key concepts. The students' integrative understanding of physical principles and problem-solving is assessed with the more complex homework problems, in-class exercises, and the exams.

Schedule

Latest Version on top (subject to change)

11/1/22		Lecture Schedule			
Week #	**Date**	**Ch.**	**Title**	**sects.**	**Projects**
1	22-Aug	1	Active Learning/Math Concepts	1-8	
	24-Aug	2a	Kinematic Variables	1-4	
	26-Aug	Lab 1	Building Math Models from Data		
2	29-Aug	2b	Kinematics in 1D	5-7	
	31-Aug	3	Kinematics in 2D	1-4	
	2-Sep	Lab 2	Modeling Motion When Walking		
3	**5-Sep**		**Labor Day**		
	7-Sep	4a	Newton's Laws	1-5	
	9-Sep	4b	Types of Forces (no lab)	6-10	
4	12-Sep	4c; 9	Statics & Torque	11-12; 1-3	
	14-Sep	5	Circular Motion	1-3,6	
	16-Sep	Lab 3	Modeling Motion When Jumping		
5	**19-Sep**	**Test 1**	**Ch. 1-5, 9**		
	21-Sep	6a	Work and Energy I	1-4	
	23-Sep	Lab 4	Living with Newton's Laws		
6	26-Sep	6b	Work and Energy II	5-9	P1 Outline
	28-Sep	7	Momentum	1-5	
	30-Sep	Lab 5	Slipping and Sliding with Shoes		
7	3-Oct	10a	Simple Harmonic: Mass & Spring	1-3	P1 Draft
	5-Oct	10b	Simple Harmonic Motion: Pendulum	4-6	
	7-Oct	Lab 6	Bending, Stretching, and Jumping		
8	10-Oct	10c	Elastic Deformation	7-8	P1 Final
	12-Oct	11a	Fluid Pressure	1-4	
	14-Oct	Lab 7	Crash Landing		
9	**17-Oct**		**Fall Break**		
	19-Oct	11b	Buoyancy	5-6	
	21-Oct	11c	Fluid Dynamics (no lab)	7-9	
10	24-Oct	11d	Viscous Fluids	10-11	
	26-Oct	**Test 2**	**Ch. 6, 7, 10, 11, Franklin Ch. 13**		
	28-Oct	Lab 8	How Strong are Your Muscles		
Week #	**Date**	**Ch.**	**Title**	**sects.**	**Projects**
11	31-Oct	12a	Temperature; Thermal Expansion	1-5	
	2-Nov	12b	Heat & Heat Capacity	6-10	
	4-Nov	Lab 9	Storing Energy in you Muscles		
12	7-Nov	13	Heat Transfer	1-4	
	9-Nov	Fr 13	Surface Tension and Capillarity	1-4	
	11-Nov	Lab 10	Under Pressure (circulatory System		
13	14-Nov	14a	Ideal Gas Law	1-2	P2 Outline
	16-Nov	14b	Kinetic Theory & Diffusion (with Franklin Ch. 16)	3-4	
	18-Nov	Lab 11	Are You Hot Stuff?		
14	21-Nov	15a	Thermodynamics & Heat Capacity	1-6	
	23-Nov				
	25-Nov		**Thanksgiving Break**		
15	28-Nov	15b	Entropy, Third Law, Body Heat (Franklin Ch. 22)	7-8, 11-12	P2 Draft
	30-Nov	16a	Waves & Sound	1-6	
	2-Dec	Lab 12	Take a Deep Breath (respiratory system)		
16	5-Dec	16b	Sound & Hearing	7-11	P2 Final
	7-Dec	17	Wave Superposition & Interference	1-6	
	9-Dec	Lab 13	What Do You Hear		
Finals	**13-Dec**	**Test 3**	**Ch 12-17** **Tuesday, 3:30 to 5:30 pm**		
Academic Calendar:		https://registrar.unl.edu/academic-calendar/			
Final Exam Schedule:		https://registrar.unl.edu/academic-calendar/fall-2022/			