PHYS 2210 Sections 001 – Physics for Scientists and Engineers I

Syllabus - Fall, 2019 (**Subject to revision** – 20191120:3:00PM)

Course Description

PHYS 2210 is an introductory calculus-based course in Classical Mechanics intended for Scientists and Engineers. You are expected to solve physics problems using the mathematical tools of algebra, geometry, trigonometry, vectors and calculus. Many students will find this to be a very demanding course that requires a significant amount of work and study time. A well prepared student (e.g. scored a 4 or 5 on AP Physics C (Mech/E&M)) planning for graduate studies in Physics should consider enrolling in PHYS 3210, *Physics for Scientists I (Honors).* Less prepared students should consider enrolling in the non-calculus-based introductory physics course PHYS 2010. Consult with an academic advisor from your major department to ensure that the chosen course satisfies your academic program requirements. **Prerequisites:** C- or better in (MATH 1210 OR MATH 1250 OR MATH 1310 OR MATH 1311 OR MATH 1220 OR MATH 1320) OR AP Calc AB score of at least 4 OR AP Calc BC score of at least 3.

Course Objectives

Students will learn concepts, principles and problem-solving techniques of Classical Mechanics involving linear and rotational dynamics, conservation laws and oscillatory/wave motion. We will begin with the study of kinematics which provides the means to mathematically describe motion in multiple dimensions. Our study will proceed to linear dynamics, otherwise known as "Newton's Laws" of motion and the forces that cause changes in the motion of objects. We will learn how to account for the effect of friction on an object's motion and perhaps the reason why "Newton's Laws" are not so obvious. The concepts and principles of mechanical work, kinetic and potential energy and the fundamental laws of conservation of momentum and energy will be examined. We will use this knowledge to determine the motion of particles in more complicated scenarios such as collisions. The principles and techniques to determine the rotational motion of extended objects will be examined in our study of rotational dynamics. Our study of angular momentum and its conservation will allow us to describe, determine and understand the motion of objects such as gyroscopes, wobbling planets and ice skaters. We will finish our examination of classical mechanics by studying the motion of harmonic oscillators and waves.

Elements of this subject material are found in all parts of nature, from subatomic particles to clusters of galaxies. The three most important objectives of this course are to: (1) learn the concepts and fundamental principles of classical mechanics; (2) learn how to describe real world phenomena quantitatively; (3) learn problem-solving skills that can be applied to other areas of science, engineering and life. The achievement of these goals will require a conceptual understanding of the physical principles, an ability to use equations to describe a phenomenon, and a methodical approach to problem solving. This understanding is achieved by a combination of reading/viewing the course material, participating in lectures and discussion sessions, working through examples, discussing questions with your TAs, LAs and other students, and **solving problems**. Working the assigned homework problems are ABSOLUTELY NECESSARY to develop this understanding. They are your practice "sessions." Many of you are in programs in engineering and other disciplines. You may question whether physics will be helpful to you. The answer is "yes!" The course will help you to understand and solve problems that occur in a broad range of disciplines.

Required Course Material

E-book/Homework: This material is **required.** ***Physics for Scientists and Engineers: A Strategic Approach with Modern Physics with MasteringPhysics, Fourth Edition*****, by Randall D. Knight.** The electronic version of the textbook and associated resources and access to MasteringPhysics and is included as "inclusive access" paid through the course fee of $105.90. Access is available through Canvas, and details will be discussed during the first class and Canvas announcements.

Course Canvas Website

Most of the course information is accessible from the PHYS 2210 course canvas page located at the URL https://utah.instructure.com/courses/569657. From the home canvas page, you will find links to the course material. Lecture slides and notes, homework and exam solutions and other information to aid your study will be hosted on the course canvas pages.

Optional Course Material

1. Unbound paper copies of the E-book are available through the MasteringPhysics web page ($44.97, free shipping). Previous versions may be available at lower cost through online vendors. Homework problems, however, may not be the same as in the current edition.

2. *Schaums Outline: "Physics for Engineering and Science"* by Michael E. Brown (ISBN-13: 978-0071810906 ISBN-10: 0071810900) provides concise explanations as well as worked example problems. Available in paperback as well as on kindle.

Copies of relevant books will be made available at the Marriott Library reserve area. It may be possible to find copies of relevant material available in various forms on the web.

Course Staff

Instructor

Wayne Springer
Office: 216 SP (Hours: M 3pm to 5pm)
Phone: 801-585-1390
Email: wayne.springer@utah.edu
(Canvas message preferred)

Coordinator

Mary Ann Woolf
Office: 205 JFB
Phone: 801-581-4246
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Teaching/Learning Assistants

Marshal/TA: Adnan Nahlawi <adnan.nahlawi@utah.edu>
TA: Qinji Zeng <qingji.zeng@utah.edu>
TA: Ren-Bo Wang<rbwang1225@gmail.com>
LA: Benjamin Bolingbroke <benjamin.bolingbroke@gmail.com>
LA: Jee Ha <jeewha94@gmail.com>

Course Meetings

Lectures:

Lecture sections meet twice a week, at 11:50 a.m. - 1:10 pm on Mondays and Wednesdays in JFB 101. We will use the lecture time to discuss concepts, work example problems and perform demonstrations. There will be three **80-minute midterm** exam during regular lecture class hours. There may also be short quizzes administered during announced lecture times.

Discussion Sections:

Discussion sections meet twice a week, on Tuesdays and Thursdays according to the schedule shown below. Students must register for one of the discussion sections. Sections 002-006 accompany lecture section 001. Group assignments and quizzes will be administered during discussion sections. These assignments will be graded and contribute to your overall grade for this class. The purpose of the discussion sections is to help you learn how to do problems, like those in the assigned homework and exams as well as better understand concepts. Example problems will be worked out in detail mainly in student groups but sometimes by the TA/LA on the board. Please arrive promptly to discussion sections to join your group. Late arrival (15 minutes) will be penalized.

SECTION	TIME	ROOM	TA	LA
2210-002	T H / 7:30AM-8:20AM	WEB L112	Adnan	Jee Ha
2210-003	T H / 9:40AM-10:30AM	LCB 225	Qinji	Ben(H)
2210-004	T H / 10:45AM-11:35AM	WEB L112	Qinji	TBD
2210-005	T H / 12:55PM-01:45PM	BU C 301	Ren-Bo	Ben(T)
2210-006	T H / 02:00PM-02:50PM	LCB 225	Ren-Bo	Ben

Course Help

Office Hours

The instructor has posted office hours: **3:00 – 5:00 pm on Mondays and by appointment**. Please allow a few extra minutes occasionally for the instructor to reach his office. Outside of these times you can meet with Prof. Springer by appointment. These may be granted very promptly, but Prof. Springer cannot guarantee specific times to meet with you outside of the posted hours. **He is best reached by Canvas e-mail**, not by phone or regular e-mail. He checks canvas e-mail most days and will respond promptly. His regular e-mail box is generally flooded despite spam filters that may reject your message if sent from Yahoo, etc. Faster response may be available from TAs/fellow students by sending a message to the online help forums/messages/email channels described below.

The TAs will also be available during the **help lab hours** described below. This is an **important resource for students**, which is often under-utilized. If you have questions that you have not been able to get answered in the discussion sections or during the lectures be sure to attend the help lab. **Doing something about getting your questions answered is your responsibility.**

Help Lab. The help lab is held in the **Room JFB 209.** The "help lab" is to help you with the current homework assignment, discuss results and solutions of exams, and give you a chance to ask questions about the course material.

PHYS 2210 -001 Help Lab Schedule (JFB 209)

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9:00 AM				Adnan(9-11)	
10:00 AM				Adnan(9-11)	BEN(10-11:30)
11:00 AM					BEN
11:30 AM					Jee(11:30-1:30)
1:00 PM					Jee(11:30-1:30)
1:30 PM					
2:00 PM					Qinji(2-3)
3:00 PM		Qinji(3-4PM)			
4:00 PM					

Online help forums/messages/email; Canvas provides on-line forums that you may use to discuss problems with fellow students**.** These forums will be regularly monitored by the TAs at times to be determined. You are encouraged to participate actively in the forums, to seek help and to offer advice to your classmates on how to approach problems. However, the forums are not to be used for posting explicit solutions to the assigned problems in any form**.** The instructor and Marshal/TA will monitor the class Canvas mail. Canvas messages are the best means of online communication to the instructor and TAs. Their personal email has SPAM filters that may delay or delete/obscure messages. These communication channels will be extensively monitored during business hours. Do NOT rely on these channels to get last-minute help after 9PM.

Private Tutoring: University Tutoring Services, 330 SSB (they offer inexpensive tutoring). There is also a list of tutors at the Physics Department office in JFB201 as well as the physics department website.

How you can do well in this class:

1. Be sure to schedule enough study time. Typically, one should expect to spend no less than 3 hours on homework and review for every hour spent in lecture. In addition, you should read the relevant materials and watch any assigned videos prior to the day of the lecture.

2. **Practice, practice, practice!** The only way to understand physics concepts well enough to use them is to practice on problems. Do the assigned discussion exercises and homework problems, review problems (before exams), and other related problems in the textbook. Practice problems by mimicking the exam situation: start with a blank sheet of paper and work the problem through as far as possible without looking for help from the text, notes, or solutions until necessary. **Doing the homework the RIGHT way is the most important factor for doing well in this course.**

Course Content & Schedule

Week	Monday Lecture	Tuesday Discussion Section	Wednesday Lecture	Thursday Discussion Section
8/19 – 8/23	Introduction/Logistics		1-D Kinematics (Ch 1-2)	Group Assignment
8/26 – 8/30	Vectors (Ch 3, hw 1 due)	Group Assignment	2-D Kinematics (Ch 4)	Group Assignment
9/2 – 9/6	Labor Day	Group Assignment (hw 2 due)	Force and Motion (ch 5)	Group Assignment
9/9 – 9/13	Motion along a line (ch 6, hw 3 due)	Group Assignment	The 3rd Law (ch 7)	Group Assignment
9/16 – 9/20	Motion in a Plane (ch 8, hw 4 due)	Group Assignment	Work & Kinetic Energy I (ch 9)	Group Assignment
9/23 – 9/27	**Review 1** (ch 1-8, hw 5 due)	Practice Midterm	**Midterm 1** (ch 1-8)	Group Assignment
9/30 – 10/4	Work & Kinetic Energy II (ch 9)	Group Assignment	Potential Energy I (ch 10)	Group Assignment
10/7 -10/11	Fall Break No Class	Fall Break No Class	Fall Break No Class	Fall Break No Class
10/14– 10/18	Conservation of Energy (ch 10, hw 6 due)	Group Assignment	Linear Momentum I (ch 11)	Group Assignment
10/21 – 10/25	Linear Momentum II (ch 11, hw 7 due)	Group Assignment	Rotational Kinematics (ch 11)	Group Assignment
10/28 – 11/1	Rotational Dynamics (ch 12 , hw 8 due)	Group Assignment	Static Equilibrium (ch 12)	Group Assignment
11/4 – 11/8	Angular Momentum (ch 12 , hw 9 due)	Group Assignment	Gravity (ch 13)	Group Assignment
11/11 – 11/15	**Review 2** (ch 1-8, hw 10 due)	Practice Midterm	**Midterm 2** (ch 1-12)	Group Assignment
11/18– 11/22	Simple Harmonic Motion (ch 15)	Group Assignment	The Pendulum (ch 15)	Group Assignment
11/25 – 11/29	Damped & Forced Oscillations (ch 15, hw 11 due)	Group Assignment	Harmonic Waves and the Wave Equation (ch 16)	Group Assignment
12/2 – 12/6	Waves and Superposition (ch 17, hw 12 due)	Group Assignment	**Review for final**	Practice Final

We will study the material in chapters **1- 17 of *Physics for Scientists and Engineers: by Knight.*** This is the standard curriculum for an introductory semester-long course in Mechanics. Any excluded sections will be announced ahead of time. Unless specifically announced, you are responsible for all material in these chapters, whether it is covered in lecture or not, as well as any supplemental material covered in the lectures. Additional material from other sources will be noted on Canvas and in lecture slides. **The due dates of the readings and homework are noted above. More detailed information concerning assignments and due dates will be made available in the class Canvas page as well as the Pearson Website.** To encourage participation each activity will account for a portion of your grade as described in the section on grade determination below.

Course Grade Determination (Subject to revision)

Assessment category	How many of each?	Points for each	Total points for category
Homework	12(2 dropped)	25	250
Group Assignments	28(3dropped)	2	50
Quizzes	12(2 dropped)	15	150
Midterm Exams	2 (0 dropped)	150	300
Final Exam	1	250	250
Total			**1000**
Bonus Points			?

Your grade for the course will be based on homework, group assignments, quizzes, midterm exams and final exam. Each individual assignment may have extra-credit points. A certain number of lowest scores for each category may possibly be dropped to accommodate emergency absences. However, students are strongly encouraged to successfully complete all assignments and exams. More details on the grading scheme will be available on Canvas after the semester starts. Your final grade will be assigned according to the total number of points you earn and the table below:

Course Grade	Point Range	Percentage based on 1000-point scale
A	930 points and above	93%
A-	890 - 929.99	89%
B+	850 - 889.99	85%
B	800 - 849.99	80%
B-	750 - 799.99	75%
C+	700 - 749.99	70%
C	650 - 699.99	65%
C-	600 - 649.99	60%
D	550 - 599.99	55%
E	below 550	

Students Must Check Course Grades

It is the **student's responsibility to ensure the accuracy of all recorded grades** (which will reflect what is in our database). The homework scores will be kept in your Mastering account, exam and quiz scores will be available on Canvas. At the end of the Semester, we will combine the appropriately weighted homework, quiz, exam and participation scores to obtain a final score to determine your course grade. These will be accessible from the Canvas website. Please check your scores regularly, keep all your returned tests (handed out during discussion sections), and contact your discussion TA in case of an error.

Getting Started with MasteringPhysics: Your first homework assignment are tutorials designed to teach you how to use the website to obtain and submit your homework assignments. Please note that to be marked correct for the problems that require numerical answers, you must pay close attention to the rules for handling significant figures, enter the correct number of significant figures (three is the typical value), and be within 1-2% of the answer (the actual numerical values used in each problem are randomized). You must also pay close attention to the units (provided in the question) in which the numerical answer must be given. Please be advised: You are likely to believe at various times that MasteringPhysics has mistakenly marked your problem in error. Look again! Check your analysis, check units, check significant figures! MasteringPhysics is by no means perfect, but experience has shown that it (and not you) will be right in 99% of these cases.

Homework

This course will use the web-based homework assignment and grading system provided by **Pearson MasteringPhysics**. You will complete all homework assignments over the web and get immediate feedback (grading)**. There will be deduction for incorrect answers on True/False and multiple-choice problems.** For most problems, you will be given up to FIVE opportunities to enter the correct answer in the web-based system. In contrast, on examinations, you **will only have 1 try and** be required to answer multiple choice problems as well as present full solutions (showing all work). We also ask you to work out all homework problems on a clean sheet of paper to be scanned as a PDF file and uploaded to Canvas. Selected scanned/uploaded solutions may be graded. Points will be assigned to both the online and written portions of the homework assignments. Compare your written solutions to the solutions provided by the TAs, which will be available after the problem set due date through Canvas.

At the end of the term, your two (2) lowest homework scores will be automatically dropped. No re-grades will be allowed, and **NO LATE HOMEWORK WILL BE ACCEPTED**. Please don't even ask. Homework is due so often and for so many students that there is no time to handle it. Solutions will be posted right away: a PDF file will be posted in Canvas. **Due dates and times, point values for each problem, and maximum number of submissions are clearly indicated on MastringPhysics for each assignment.** Barring some long-term server catastrophe at MasteringPhysics, you are responsible for understanding and meeting these terms.

Group Assignments and Quizzes

Group assignments and, occasionally, quizzes will be administered during discussion sections. There will typically be a group problem assignment every discussion section meeting. Please arrive promptly to discussion sections to join your group. Late arrival (15 minutes) will be penalized. Quizzes will be administered through the class Canvas website. The quizzes will typically be related to the group assignments of that week.

Midterms and Final Exam

For detailed rules please refer to the Exam Procedures page. There are two (2) midterm exams and a final exam. **YOU MUST TAKE THE FINAL EXAM TO PASS THIS COURSE**. All exams are closed book. You may not bring any materials to the exams but a single 4" x 6" note card (both sides may be used), with helpful equations and relationships on it, and a calculator. The tests will not be easy. Normal scientific and graphing calculators are allowed during exams. We do not allow laptop PCs, ipads or other devices with significant text (alphanumeric) storage capability, or those with wireless communications devices. If there is any doubt as to whether an item is allowed, ask your TA. The TA's decision is final.

All midterms, as well as the Final Exam are comprehensive. Before each midterm a review containing problems from previous exams will be posted on the main website. They are a good measure of what this semester's exams will be like. **Other old midterm exams** from previous versions of this course are available. I do not guarantee that they will be completely relevant to the present exams, as the course content and emphasis has changed over the years.

Midterm Exam Schedule (Check Canvas for any updates!)

Midterm 1: Wednesday September 25, 2019 in S BEH AUD (Social & Behavioral Sciences Auditorium)
Midterm 2: Wednesday November 13, 2019 in S BEH AUD

Midterm exams last 80 minutes. **Please arrive 10-15 minutes early on exam days** so that we may get you seated, get the exams distributed, and allow you the full time to complete the exam.

Make-up exams will only be offered in the following cases (a) absence due to a University sponsored activity or to military or jury duty, and (b) serious medical emergencies. In any case the student must provide complete documentation. All requests for exam accommodations are handled exclusively by Professor Springer. In the case of exception (a) the request for a make-up exam must be filed with Professor Springer **at least one week in advance** of the anticipated absence. **Please note that all exam dates and times have already been determined; mark your calendars now! Resolve any conflicts as soon as possible**!

Final Exam Schedule

The final exam will be held Monday December 9, 2019 3:30-5:30 PM in (Gardner Commons) GC 1900. This is a special departmental University scheduled exam time. **THERE WILL BE NO EARLY FINAL EXAMS!**
Any request for re-grading of a problem on an exam must be made before the following exam. You must fill out a re-grade form (found on Canvas) and attach it to the entire problem (not just one part) to be re-graded. (Do NOT submit problems that you are not asking to be re-graded.) You must use a separate re-grade form for each problem. These sheets should be given to Professor Springer in class before the next midterm exam. In the case of Midterm #3 (last midterm), you must submit a request for re-grading before the end of the last course lecture. Problems will NOT be re-graded after the next exam occurs. **Exams MUST be done in black or blue pen (NOT red), to be eligible for a re-grade**. **No exam done in pencil will be re-graded**. When you submit a request for the re-grading of a problem, the entire problem will be re-graded, not just the parts that you are disputing. It is **usually** the case that you will not lose points by submitting a re-grade, but this is not guaranteed. Submitted problems for re-grade will be evaluated and returned with the following exam. You may ask for re-grades on the final exam. This request will only be considered in the case that you are near a course grade boundary, and there are some additional special rules. The request must be made by 5 pm on December XX,2019. You must turn in a re-grade form for each problem, just as with the midterms. However, you must turn in the entire final exam for a re-grade. **The entire exam will be re-graded** (not just the problems you submit for a re-grade).

University Information & Disclosures

Drop/Add/Withdrawal

Last day to drop class is Friday August 30. Last day to withdraw is Friday October 18. Please verify with the official University Academic Calendar at https://registrar.utah.edu/academic-calendars/fall2019.php.

Honesty

Cheating of any kind on an exam is a very serious violation of University rules and is unethical. Students caught cheating will receive a failing grade for the course and will be sent on to the University Disciplinary Committee for further action. All teaching assistants, including the course Marshal and the administrative assistant for the course are to be considered proxies for Dr Springer when you are dealing with them regarding this course. They are to be listened to and treated with respect always. All students and faculty need to be aware of important changes in the Student Code that went into effect in the last couple of years. Students now have only 20 business days to appeal grades and other "academic actions" (e.g., results of comprehensive exams). The date that grades are posted on the web is considered the date of notification. A "business day" is every day the university is open for business, excluding weekends and University-recognized holidays. If the student cannot get a response from the faculty member after ten days of reasonable efforts to contact him or her, the student may appeal to the Department Chair if done within 40 days of being notified of the academic action. Students should document their efforts to contact a faculty member. Similarly, faculty members who discover or receive a complaint of academic misconduct (e.g., cheating, plagiarism) have 20 business days to "make reasonable efforts" to contact the student and discuss the alleged misconduct. Within 10 more business days the faculty member must give the student written notice of the sanction, if any, and the student's right to appeal to the college Academic Appeals Committee.

All students and faculty members are urged to consult the exact text of the Student Code if a relevant situation arises. The code is on the University web site at http://www.admin.utah.edu/ppmanual/8/8-10.html.

Accommodations
The Americans with Disabilities Act. The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability and Access, 162 Olpin Union Building, (801) 581-5020. CDA will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability and Access.

Student Names and Pronouns
Class rosters are provided to the instructor with the student's legal name as well as "Preferred first name" (if previously entered by you in the Student Profile section of your CIS account). Though CIS refers to this as a preference, I will respect you by using the name and pronoun that feels best for you. Please advise me of any name or pronoun changes (and update CIS) so the instructional team can best create a welcoming learning environment. If you need assistance getting your preferred name on your uID card, please visit the LGBT Resource Center Room 409 in the Olpin Union Building, or email bpeacock@sa.utah.edu to schedule a time to drop by. The LGBT Resource Center hours are M, W-F 8am-5pm, and 8am-6pm on Tuesdays.

Wellness Statement
Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences,etc., can interfere with a student's ability to succeed and thrive at the University of Utah. For helpful resources, contact the Center for Student Wellness; 801-581-7776.

Veterans Center
If you are a student veteran, the University of Utah has a Veterans Support Center located in Room 161 in the Olpin Union Building. Please visit their website for more information about what support they offer, a list of ongoing events and links to outside resources. Please also let me know if you need any additional support in this class for any reason.

Learners of English as an Additional/Second Language
If you are an English language learner, please be aware of several resources on campus that will support you with your language and writing development. These resources include: the Writing Center; the Writing Program; and the English Language Institute. Please let me know if there is any additional support you would like to discuss for this class.