

## P211: General Physics Mechanics - WC – FALL 19

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### Course Description:

Calculus-based study of the basic concepts of mechanics: motion, force, Newton's laws, energy, collisions, and rotation. A full list of course objectives can be found in Canvas.

### Course Prerequisites

Concurrent: MATH 140

### Course Topics:

The general topics of Phys 211 are

1. Relating position, velocity, acceleration and time using kinematics relationships
2. Using vectors
3. Forces and Newton's Laws of Motion
4. Rotational Motion and Rigid Bodies
5. Conservation laws
6. Oscillations

A detailed list of course objectives can be found at the end of this document.

### Required Material and Website:

The course is set in Canvas is <https://psu.instructure.com/>.

The text for this course is **Physics for Scientists and Engineers: A Strategic Approach by Knight, 4<sup>th</sup> edition**. This course will cover (in parts) chapters 1-13 and 15.

The soft-cover PSU custom “split” with these chapters, available at the world campus bookstore, also contains access to the MasteringPhysics homework system we will be using in the course. In addition, you are also required to buy or rent the **IOlab device** which we will use to do hands-on lab from anywhere (this is absolutely necessary to do the labs).

Important websites are

1. World campus bookstore to buy custom textbook that comes with access to MasteringPhysics and to buy the iOLab. Ship fast anywhere in the world.  
[https://bookstore.mbsdirect.net/vbm/vb\\_home.php?FVCUSNO=30113&url=psude.htm](https://bookstore.mbsdirect.net/vbm/vb_home.php?FVCUSNO=30113&url=psude.htm)

2. Macmillan. You can buy or rent the iOLab from them directly. This is a bit cheaper but shipping may be worse and slower.

<https://www.macmillanlearning.com/college/us/digital/iolab>

It is very important that you buy (or rent) the equipment/textbook quickly. You can get a 14 days free access to MasteringPhysics but after that you need to pay and the access code that comes with the special custom book at the WC.

Failure to get the lab equipment on time for the first lab will result in a zero on each labs that you missed. Failure to do any of the labs will result in your grade lowered to a D at the end of the semester irrespective of your performance in other parts of the class. This is a lab course and the labs cannot be simply skipped.

If you intend to continue with Phys 212 in an online format the IOLab will again be used. We therefore recommend buying it or renting for longer period of time than just this semester.

### Structure of the class:

This is a 4 credit course that is fairly intensive with course work due almost every day. A standard week contains three phases: exploratory phase, problem solving phase and revision phase. The exploratory phase of a giving week overlaps with the revision phase of the previous week. The final assignment for a week are due on Tuesday of the next week allowing time to review and discuss.

<i>Days</i>	<i>Wednesday</i>	<i>Thursday</i>	<i>Friday</i>	<i>Saturday</i>	<i>Sunday</i>	<i>Monday</i>	<i>Tuesday</i>
	Exploratory Phase		Problem-solving phase		Revision Phase Start Exploratory Phase for next week		
<i>Graded assignments due</i>	Discussion boards – first post	Reading quiz		Tutorial/Lab first draft	Discussion boards – Replies	Peer-reviews	Tutorial/Lab final version Quiz
<i>Live sessions</i>		Office hours				Learning sessions	

Not every week will contain all different types of assignments. For an exam week, the exam is on Thursday (on the material of the previous weeks).

Most of the material is posted ahead and it is entirely possible for you to adjust this schedule to fit better with your own work/study schedule.

## Course Components:

1. **Reading quiz:** We will be using an online computer grading system called MasteringPhysics (<https://www.pearsonmylabandmastering.com>) to do reading quiz (our course ID is **leblond58385**). Access to MasteringPhysics is provided in the PSU custom book in the bookstore.

The reading quiz are due early in the week and they are meant to be a first learning and practice. Most of the questions are tutorials that will walk you through how to solve problems. You get immediate feedback when answering questions and many questions provide hints.

2. **Tutorial:** Each week, we will have a tutorial. There are three options on how to do the tutorials.
  - a. Print it and write your answer by hand, take a picture (or a scan) and submit.
  - b. Use a blank sheet, write your answer by hand clearly numbering them. Take a pic or scan and submit.
  - c. Using a tablet, write your answer by hand on the tutorial pdf and submit.

In this type of assignments, we will grade your work and not just your answer. If you have a real professional scanner, that will work great. If we have to use a phone we recommend to use scanning app which do better than just pictures.

3. **Laboratories:** The laboratories (8 in total) are designed to provide you with hands-on experience with the material being investigated in class as well as teaching data sense-making and observational experimental methods. See the list of learning objectives for more details. All of those skills and topics learned in the lab may be tested in the exams. The lab will be using the IOLab device various sensors together with the accompanying software. **While the lab component is officially only worth 10% of the grade, a zero on all labs will result in a letter grade of D at best irrespective of all other course work.**
4. **Peer-Review:** It is very beneficial for students to see each other works and to receive and give feedback. Therefore, a first draft of the weekly tutorial and lab is required to be posted every Saturday. You will then be randomly assigned to peer-review multiple of your peers and give feedback on their work (not grade their work which is only a draft anyway). The instructors will also review each draft submission and help out where needed. The tutorial and lab will then be resubmitted for grading every Tuesday. The peer-review is graded and is part of the quiz grade. As you will see, there are some points every week in the quiz assigned to a peer-review question.

5. **Discussion Boards:** Maybe the most important part of this course is the weekly discussion board. You will be assigned a team and you will need to post and reply to your teammates.

Often the post will include three parts,

- A. Your answers and reasoning to a couple of conceptual questions on the material
- B. Comments/questions on your work on the tutorial
- C. Comments/questions on your work on the lab

Instructor and TA will provide **feedback** in the discussion boards. The discussion boards are the online analog of a lecture where the students discuss with continuous instructor feedback.

The first post of the discussion is due on Wednesday but replies will continue as long as needed.

6. **Quiz:** There will be individual quizzes throughout the semester with questions that closely resembled the exams. These are graded on correctness. You get two tries and the best score is kept. The quiz will also self-reflections questions and this is where the points for the peer-review will be attributed.
7. **LA sessions:** These are required live discussions once a week where we will review previous material and look ahead to the upcoming week. These sessions will be hosted by learning assistants, teaching assistant and the instructor. We will have multiple time options.
8. **Discussion hour with the prof:** I will host a discussion hour on Thursdays (not graded or required but very useful). These may be recorded but I will need students to start the discussions!

## Grading Policy

Your grade in the course will be based on your performance in the labs/tutorials, on the quizzes, on the discussion boards/wrap-ups/peer-reviews and on the exams with the following weights:

Reading quiz	Quiz	Discussion boards	Labs	Tutorial	Midterms	Final	Concept Surveys	LA sessions
5%	5%	5%	10%	5%	45%	20%	2%	3%

Exams: There will be three midterm exams (09/19, 10/17, 11/14) and a final exam (12/19). All midterms are worth the same: 15% each for a total of 45%.

Exams will be closed book. Relevant physical constants and formulae will be provided. Calculators, cellular phones and other communication devices are NOT allowed and the exam will be designed such that they are not needed. The exams will be based on the assigned reading in the textbook, the material covered in course content, the quizzes, discussion boards and the laboratories/tutorial.

Each exam will be delivered through Canvas. All exams are proctored **using Examity** which allow you to take the exam anywhere and to schedule at any time (in the appropriate time window where the exam is opened). By taking this course and using Examity you agree to the following

*"This course may require you to take exams using certain proctoring software that uses your computer's webcam or other technology to monitor and/or record your activity during exams. The proctoring software may be listening to you, monitoring your computer screen, and viewing you and your surroundings. By enrolling in this course, you consent to the use of the proctoring software selected by your instructor, including but not limited to any audio and/or visual monitoring which may be recorded."*

The reading quiz score is calculated as the average of the scores of each reading assignment; all assignments are weighted equally. Since this is really meant to be practice we will have a 60% threshold so that 60% on the reading quiz is equivalent to 100%.

Surveys: The surveys category refers to 2 different concepts quiz done at home but proctored via Examity (they only take 30 minutes).

- The pre-concept quiz can be scheduled at any time on Aug 30-31. The test is designed to evaluate the course (not you). Knowing how you think will help me teach better. You are only graded for participation, not correctness, it is worth 1%.
- The post-concept quiz can be scheduled at any time on Dec 6-7. The test is designed to evaluate the course (not you). Knowing how you think will help me teach better. You are only graded for participation, not correctness, it is worth 1 %.

LA sessions: The learning assistant sessions are 50 minutes live meetings held via camera and audio on zoom. We will aim to have group of about 10 and they will be hosted by either learning assistants, teaching assistant or the instructor. Learning assistants are undergraduate peers that took this course in a previous semester. The teaching assistant for this class is a graduate student. The LA sessions are graded on participation only.

Final letter grades for the course will be based on an absolute scale. The course score will be rounded to the nearest integer (69.49 becomes a 69; 69.50 becomes a 70). No curving of any kind will be employed unless the combined average exam score (computed as the combined average of all midterm and final exams taken to date) is less than 70%. In such cases, the grades on the most recent exam will be adjusted by additively raising the exam scores to allow the combined exam average to meet the target minimum of 70%.

The break points for the various grade levels are:

93% ≤	A	≤ 100%
90% ≤	A-	< 93%
87% ≤	B+	< 90%
83% ≤	B	< 87%
80% ≤	B-	< 83%
77% ≤	C+	< 80%
70% ≤	C	< 77%
60% ≤	D	< 70%
0% ≤	F	< 60%

You are responsible for **verifying all of your scores** (with the exception of the final exam score) **before** the final exam.

## Excuses and Missed Work

We will not provide extensions on any deadline. We will not provide makeups (except possibly for exams). Any missed work will receive a 0 unless there are special circumstances that warrant an excuse (see below)

*To account for emergencies, we will drop the lowest score in each of the following categories*

- Reading quiz
- quiz
- Tutorial
- Lab
- Exam wrapper

*For the discussion boards category, we will drop the lowest 2 (one discussion boards). For the LA sessions, we will allow for 3 absences through the semester.*

Examinations: The lowest *exam score WILL NOT be dropped*. In the case of sudden or unexpected events that will cause them miss an exam, students are required to notify the instructor prior to the exam or as soon as is reasonably possible. Students that are physically unable to take the exam (e.g., because of an illness) at the regularly scheduled time should not attempt to attend the exam (once an examination is taken, its result is final). Makeup exams should be taken no later than three business days after being able to return to classwork; students that do not take the exam within a reasonable time frame may receive a zero for the exam. Barring emergencies, only one makeup opportunity is granted for each exam.

If an emergency is making you miss multiple coursework, please contact the instructor. Excuses will be granted for valid reasons such as

- Family emergencies. This include a death in the immediate family, death of a close friend, sudden hospitalization of a close family member, and events of similar gravity. Students should inform the course administrator about the family emergency as soon as possible.
- Student illness and injuries
- To obtain an excuse for university-approved curricular and extra-curricular activities, a student needs to obtain a letter (or a class absence form) from the unit or department sponsoring the activity. The letter must indicate the anticipated absence dates, and it must be submitted by email (or in person) to the course coordinator. A class absence form does not need to be provided for labs (only for exams and for lecture attendance).

## Academic Integrity

Pretty simple really, don't cheat and don't plagiarize. If you think you are doing something wrong, you probably are. We take academic integrity very seriously. There are many ways to get help in this course and we hope you do contact any member of the instructional team if you feel unsure about the material and worry about your grade. Our goal is for you to learn the material and succeed in the course. Everyone can get an A and we are ready to help any students that struggle.

In exchange for your hard work, participation and academic integrity we promise to create the best learning environments that we can and to help you as much as we can. There will be many opportunities for help and we are fair to all students. Collaborations and discussions among the students are strongly encouraged (they help learning) but we expect your best efforts to individually learn the material and we expect honesty and academic integrity in all aspects of the course.

As described in [The Penn State Principles](#), academic integrity is the basic guiding principle for all academic activity at Penn State University, allowing the pursuit of scholarly activity in an open, honest, and responsible manner. We expect that each student will practice integrity in regard to all academic assignments and will not tolerate or engage in acts of falsification, misrepresentation, or deception. To protect the fundamental ethical principles of the University community and the worth of work completed by others, we will record and report to the office of Judicial Affairs all instances of academic dishonesty.

## Disability Policy

Penn State welcomes students with disabilities into the University's educational programs. Every Penn State campus has an office for students with disabilities. Student Disability Resources (SDR) Web site provides contact information for every Penn State campus: <http://equity.psu.edu/sdr/disability-coordinator>. For further information, please visit Student Disability Resources Web site: <http://equity.psu.edu/sdr>.

In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: <http://equity.psu.edu/sdr/guidelines>. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with an accommodation letter. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. You must follow this process for every semester that you request accommodations.



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### **Learning Objectives for Physics 211 Fall 2019**

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We hope that Phys 211 will allow you to evaluate the impact of technology and physics in your daily life as well as to encounter the order, diversity, and beauty of nature.

#### General learning and metacognition objectives, through this course students will be able to

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LOGen	General learning objectives.
LOGen01	read a physics textbook using paraphrasing and do the examples without looking at solutions.
LOGen02	apply proper time management and self-study skills (due dates are enforced).
LOGen03	discuss physics effectively in asynchronous discussion boards.
LOGen04	define the five steps of metacognition: assess, evaluate, plan, apply, reflect.
LOGen05	differentiate deep processing from shallow processing.
LOGen06	identify and define the four principles of deep processing: elaboration, distinctiveness, personal and appropriate.

#### Lab learning objectives, by performing and discussing the lab students will be able to

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<b>LoLab</b>	<b>Data sense-making and observation experiment lab objectives</b>
LOLab01	present data using graphs and tables that are correctly labeled and correctly scaled.
LOLab02	design and perform a reliable experiment that investigates a phenomenon.
LOLab03	identify dependent, independent and controlled variables in an experiment.
LOLab04	identify patterns in the data and devise an explanation for an observed pattern.
LOLab05	use visual tools such as box plot and scatter plot to visualize data.
LOLab06	use statistical concepts like correlation, means, outliers to make decisions based on data.
LOLab07	identify shortcomings of an experiment and suggest improvements.
LOLab08	use the slope and intercept of the “best fit” to find the values of physical quantities.

#### Content Objectives.

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##### **By the first midterm, students will be able to...**

<b>LOPro</b>	<b>Process/Problem Solving Objectives</b>
LOPro01	read and interpret graphs and data
LOPro02	use proportional reasoning to analyze relationships
LOPro03	work with and convert units
LOPro04	critique proposed analyses of physical situations
LOPro05	differentiate and integrate polynomial functions
LOPro06	solve simultaneous linear equations
LOPro07	use dimensional analysis to predict the dependence on the parameters
LOPro08	assess the validity of a solution by checking limits, units and sensibility of the numbers.

<b>LOVec</b>	<b>Vector Related Objectives</b>
LOVec01	convert between magnitude-angle and component vector representations
LOVec02	graphically perform vector arithmetic
LOVec03	perform vector arithmetic using components

<b>LOKin</b>	<b>Kinematics Related Objectives</b>
LOKin01	translate descriptions of motion into motion diagrams and vice versa
LOKin02	understand & differentiate between average and instantaneous quantities
LOKin03	distinguish & relate position, velocity and acceleration using slopes/derivatives and areas/integrals of functions with respect to time
LOKin04	relate and create time dependent plots of kinematic variables
LOKin05	understand and be able to convert between different reference frames
LOKin06	decompose multi-dimensional problems into multiple one dimensional ones
<i>Midterm 1 may also contain multiple choice questions on LOGen04-06 and LOLab1-4</i>	

**By the second midterm, students additionally will be able to...**

<b>LOKin</b>	<b>Kinematics Related Objectives</b>
LOKin07	apply kinematics projectile motion with no drag.
<b>LODyn</b>	<b>Dynamics Related Objectives</b>
LODyn00	identify the object/system of interest and all contact/long range forces acting it.
LODyn01	apply the idea that net forces are related to acceleration, not velocity
LODyn02	draw and use force diagrams (free-body diagrams) to analyze static and dynamic systems
LODyn03	differentiate and analyze the effects of kinetic and static friction
LODyn04	understand the effects of the force of drag, gravity and normal.
LODyn05	identify and make use of action-reaction force pairs (third law partners)
LODyn06	solve force problems with multiple interacting objects and constraints

*Midterm 2 may also contain multiple choice questions on LOGen04-06 and LOLab1-8*

**By the third midterm, students additionally will be able to...**

<b>LOKin</b>	<b>Kinematics Related Objectives</b>
LOKin08	apply kinematics to oscillations where the acceleration is not constant
LOKin09	relate angular and linear kinematic variables in <b>uniform</b> circular motion
<b>LODyn</b>	<b>Dynamics Related Objectives.</b>
LODyn07	analyze uniform circular motion in an inertial reference frame with no fictitious forces
LODyn08	understand and use Hooke's law for spring force
LODyn09	analyze the properties of simple harmonic oscillator and determine the frequency of oscillations
<b>LOPro</b>	<b>Process/Problem Solving Objectives</b>
LOPro09	understand phase constants and the trigonometry of oscillations
<b>LOVec</b>	<b>Vector Related Objectives</b>
LOVec04	perform and interpret the meaning of dot products
<b>LONrg</b>	<b>Energy Related Objectives</b>
LONrg01	calculate the work done on an object or system of objects
LONrg02	understand work as a transfer of energy from one object/system to
LONrg03	understand the meaning of and determine the kinetic energy of an object
LONrg04	interpret how dissipative forces lead to thermal energy
LONrg05	differentiate and relate power and work/energy
LONrg06	relate potential energies and conservative forces & compute one from the other
LONrg07	draw energy bar charts to account for energy change
LONrg08	analyze motion using (& knowing when you can use) energy conservation
LONrg09	interpret and extract information about motion from potential energy diagrams
LONrg10	apply conservation of energy to oscillating systems.

*Midterm 3 may also contain multiple choice questions on LOGen04-06 and LOLab1-8*

**By the fourth (Final) midterm, students additionally will be able to...**

<b>LOMom</b>	<b>Momentum Related Objectives</b>
LOMom00	define and identify isolated systems
LOMom01	understand that external forces are required to change momentum
LOMom02	determine the impulse from a given force or motion descriptions
LOMom03	analyze interactions between objects using momentum conservation
LOMom04	extend momentum ideas to rotating systems (angular momentum)
<b>LOVec</b>	<b>Vector Related Objectives</b>
LOVec05	perform and interpret the meaning of cross products
<b>LONrg</b>	<b>Energy Related Objectives</b>
LONrg11	understand and use rotational kinetic energy
<b>LOKin</b>	<b>Kinematics Related Objectives</b>
LOKin10	relate angular and linear kinematic variables for non-uniform circular motion
<b>LODyn</b>	<b>Dynamics Related Objectives</b>
LODyn10	analyze non-uniform circular motion in an inertial reference frame with no fictitious forces
LODyn11	extend dynamics ideas to rigid bodies (torque)
LODyn12	combine torques and forces to analyze multi-steps problem such as equilibrium
LODyn13	apply dynamics ideas to rolling motion.
LODyn14	understand and use the universal law of gravity, relating $g$ & $G$
<b>LOB</b>	<b>Bodies Objectives</b>
LOB01	visualize & calculate the center of mass (COM) of an extended object or set of objects
LOB02	understand motion in terms of the COM & use COM to determine motion of parts
LOB03	visualize & calculate the moment of inertia around a fixed axis for a rigid object.

*The Final exam may also contain multiple choice questions on LOGen04-06 and LOLab1-8*