PHYS 250: Introductory Physics I, General Syllabus

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Credits 4

Materials

Textbook

The text for this course is College Physics: Explore and Apply by Etkina et al, 2nd edition. This course will cover topics from Chapters 1-11, 13 & 14.

Homework

The problem set assignments will be administered through Expert TA, a web-based homework program. Access to Expert TA requires registration using your @psu.edu email address. A link to this system's website is here: http://theexpertta.com/. Using this homework system is a required portion of the course. Homeworks will be due on Tuesdays at 11:59pm each week. There will be a very short assignment which walks you through how to use the Expert TA system (10 minutes.) Payment to join this system is available as a web transaction through the Expert TA website and through purchase of an access code from the HUB bookstore. The first 14 days of the semester are available with full access as a free trial, so there is some time to work out the payment details without missing any work.

iClicker

iClickers are required in PHYS 250. These are available from the bookstore and elsewhere. Using your iClicker in lecture is a graded component of the course. You can find out about obtaining and registering iClickers on the ITS iClicker website: clickers.psu.edu. Clickers need to be registered in the Canvas system at clickers.psu.edu.

Course Description

Algebra-based introduction to mechanics and sound including such topics as, one- and two-dimensional motion, vectors, relative and circular motion, force and dynamics, Newton's laws of motion, work and kinetic energy, potential energy and energy conservation, momentum, rotational motion and angular velocity, static equilibrium and properties of materials, static and moving fluids, vibrations, simple harmonic motion, general properties of waves, sound, and human hearing.

For a detailed listing of lecture topics and a schedule of major course events, please refer to the course calendar in Canvas.

Course Objectives

1. Describing Motion
    a. Distinguish and relate position, displacement, velocity and acceleration using slopes and areas of graphs, particularly velocity versus time graphs.
    b. Relate position, displacement, velocity and acceleration for constant acceleration situations (e.g., free fall) using the $x/v/v^2$ equations.
    c. Solve a two-dimensional problem by decomposing it into two separate one dimensional problems (e.g., projectile motion).
    d. Recognize that an object moving in a circle has a constant, inwards acceleration whose magnitude depends on the object's speed and radius of the circle. (Centripetal acceleration).
    e. Use vector relations to add and subtract vectors and to convert vectors from magnitude-angle to component form and vice-versa.
2. Newton's Laws of Motion
    a. Consistently apply the idea that net forces are directly related to acceleration, not velocity. (Newton's First & Second Laws) NOTE: This is one of the most important ideas in the course.
    b. Draw a free-body diagram for a situation and use the diagram to determine the net force (in each direction) on an object and relate the net force to the object's mass and acceleration. (Newton's Second Law)
    c. Use the concept of gravitational field to analyze the motion of objects near the surface of the Earth and in planetary motion (Newton's Law of Gravity). (near the surface of the Earth and for planetary motion)
    d. Recognize that all forces are two-way interactions between two objects and that these two object exert equal (in magnitude) but opposite (in direction) forces on each other. (Newton's Third Law)
    e. Be able to use selective grouping and curved coordinate systems to solve problems of multiple connected objects.
3. Rotational Motion
    a. Apply all the kinematics relationships for one-dimensional motion to rotational motion, substituting angular variables for linear ones (e.g. θ for x).
    b. Determine the torque on an object given the force applied and where the force is applied relative to the axis of rotation of the object.
    c. Calculate the moment of inertia (resistance to angular acceleration) of an object given its distribution of mass and axis of rotation.
    d. Relate the net torque on an object to its moment of inertia and angular acceleration.
    e. Locate the center of mass (CoM) of an extended object or a collection of objects and recognize that the CoM is the point around which there is no gravitational torque.

f. Use both forces and torques to analyze systems in equilibrium (e.g., determine all the forces acting on a system in equilibrium), and use the notion of a lever in the analysis.

4. Momentum
   a. Relate the force and time the force is applied (e.g., with a force versus time graph) to the impulse and change in momentum of an object.
   b. Analyze interactions between objects (e.g., collisions, explosions) in closed systems using conservation of momentum.
   c. Explain the change in rotational speed of objects in terms of conservation of angular momentum.
5. Energy
   a. Distinguish the concepts of force and energy and be able to calculate the work done by a force on a system and relate that to the change in energy of the system.
   b. Calculate the gravitational potential energy, elastic potential energy, kinetic energy, and rotational kinetic energy of a system.
   c. Use conservation of energy to analyze closed systems (including elastic collisions) and determine the energy transfer in/out of systems that are not closed (including inelastic collisions).
   d. Determine the power used by/added to a system in terms of the rate of change of energy of the system.
6. Fluids
   a. Articulate the relationship between pressure and force; determine the pressure throughout a fluid and relate pressure changes to density and variations in depth.
   b. Relate the buoyant force on an object to the weight of the fluid displaced by the object; be able to analyze situations in which the object is floating, neutrally buoyant, or completely submerged in the fluid.
   c. Relate the speeds of incompressible fluids in different segments of pipes through the continuity equation
   d. Relate the speeds of different segments of a fluid flow at different altitudes and pressure through Bernoulli's equation.
7. Oscillations and Waves
   a. Analyze the behavior of simple harmonic oscillators (including mass-spring systems and simple pendulums) in terms of energy and the position, velocity, and acceleration equations.
   b. Determine the resonant frequency and period of an oscillator (e.g., pendulum, mass on spring) and articulate that the amplitude does not affect the frequency/period for a simple harmonic oscillator.
   c. Graphically determine the effect of two transverse wave pulses passing through one another.
   d. Determine amplitude, frequency (pitch), period, wavelength, and wave speed from time- and/or position-graphs of a wave or when provided similar information about the wave; in particular, relate frequency, wavelength and wave speed.
   e. Determine the effect on wave speed and frequency of oscillation of a standing wave when changing one or more of these variables: length of the standing wave, mass/length of the medium, tension of the medium.
   f. Relate the effect of different harmonics on the wavelength and frequency of standing waves in strings, open tubes, and closed tubes.

Exams

There will be three exams. The final exam is comprehensive. Exam rules, sample exams, study resources and more are available in the Exam Resources section of Canvas.

Assistance Sessions

We provide free assistance with all aspects of the PHYS 250 course. Dr. Smitka and TAs will be available to assist during office hours and at the Physics Assistance Resource Center (PARC.) The listing of exact hours and locations is available on the Canvas website. All course staff are able to assist with course content questions relating to homework, exam prep, recitations, and lab.

Group Work

PHYS 250 requires group work during lab and recitation. Students are encouraged to work together and collaborate on assignments; however, work submitted for individual assessment must be the work of the individual student. A good way to ensure this is to make sure, even when working in groups that you each write up your responses independently of everyone else. Please refer to the Academic Integrity Policy. If you have any problems with the homework, please see any of the TAs in the course or the lecturer during their office hours, or contact them to set up an appointment to meet.

Course Prerequisites

MATH 022 & MATH 026; or MATH 040; or MATH 041 or satisfactory performance on the mathematics proficiency examination.

Grading Policy

Your grade in the course will be based on your work in lecture, your performance in the labs, in recitation, on the homework assignments, and on the exams with the following weights:

5% Participation
10% Homework
10% Recitation
10% Laboratories
20% Midterm 1
20% Midterm 2
25% Final Exam

Lecture Participation:
Lecture participation is expected. Participation will take the form of interactive demos, in-class problem solutions, in-class activities, and iClicker questions. Reading the textbook prior to class is expected and will be assessed using iClicker questions at the beginning of lectures. This assessment falls under the participation category.

Clicker scores are pooled into 3-week long blocks. A full participation score is awarded for an individual 3-week long block in which 80% of the questions are answered correctly. Each question gives the opportunity to earn 2 points: 1 point for submitting an answer and one point for selecting the correct answer. Please note that lectures will contain a differing number of clicker questions and participation grades are calculated based on the number of questions answered, not number of lectures attended.

If at the end of the semester it is the case that a student's exam average is greater than their participation average, then the student's participation average score will be replaced with their exam average score. The exam average will

constitute the 5% of total course credit allotted for participation.

Homework

The total homework score is calculated as the average of the scores of all homework assignments. A full homework score is awarded for an individual assignment that is 90% correct. All homework assignments are weighted equally. The instructions for each assignment will describe how the number of points earned on a problem decreases on subsequent submissions.

Labs and Recitations

Each lab and recitation carries equal weight. TAs administer lab and recitation sections and grade the reports. It generally takes about 1 week for TAs to record lab and recitation grades in the Canvas gradebook. If a student notices an activity grade score to be missing one week or more following the activity, then the student should first attempt to resolve the matter first by contacting the TA then, if the TA is unresponsive, contacting Dr. Smitka. Lab and recitation grade disputes must be resolved prior to the Monday starting final exams week.

Course Grades

Final letter grades for the course will be based on an absolute scale. You can verify the calculation of your score by using the Canvas gradebook and this procedure:

The course grade will be rounded to the nearest integer. The combined average exam score (computed as the combined, weighted average of all midterm and final exams taken to date) will be rounded to 70% if it 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%.

Course grades will be assigned according to the following grading scheme:

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 for the course. All requests for grade adjustments must be submitted to Dr. Smitka no later than the Monday starting final exam week.

Attendance Policy

Lecture

You must attend the lecture section for which you are registered. We will use iClickers in class for three different types of questions in lecture: (1) reading quizzes

or review questions at the beginning of each class, (2) in-class concept questions designed to challenge your thinking, and (3) review of material covered to make sure everyone understands what we just discussed. You can find out about obtaining and registering iClickers on the ITS Clicker website: clickers.psu.edu. When registering you must use your PSU email address (e.g., abc123@psu.edu) to register your clicker in order to receive credit. If you register through the link in Canvas it will automatically register you correctly. Clicker registrations need to be renewed each fall semester.

"Clicker questions" are multiple choice, conceptual questions that are designed to help point out common misconceptions and provide feedback during the class. They are designed to help students know when they understand the topic at hand, and help your instructor to know when more discussion is needed for a given topic.

To avoid accidentally swapping a clicker with another student, be sure to put your name or some other identifying feature on your clicker. You must attend your scheduled PHYS 250 section.

Appropriate use of clickers by their owner during their class is an expectation of the course. **Asking someone to use your clicker for you is asking that person to help you cheat. If someone asks you to use their clicker, that person is asking you to help them cheat. If you agree, you have helped them cheat.** Students that misuse clickers in such a way may lose all clicker points accrued up to and including the day in question. Please refer to the Academic Integrity Policy of this syllabus for more details. Students verified to have misused clickers will be receive official academic integrity violations, filed through the standard PSU system.

Laboratories

Laboratory sections meet once a week in room 209 Osmond. Your meeting time is determined by your section number. You must attend the laboratory section in which you are scheduled — no switching is permitted without discussing the matter with the instructor.

The laboratories are designed to provide students with hands-on experience with the material being investigated in class. Laboratory instructors lead the laboratory sessions and act as your guides as you explore the material. You will work collaboratively in three-member lab groups to carry out the experiments. The experiments are in the Laboratories section of the Canvas website for free.

During the lab session, your group will prepare a single write-up, addressing specific points of the experiments. This write-up must be submitted by your group before the end of the laboratory session and all group members must be present when the report is submitted in person to the laboratory instructor. At each lab session, each student is responsible for writing their own name on the lab document and initialing the sign-in sheet to verify attendance.

Recitation

Recitation sections meet each week. Your meeting time and room are determined by your section number. You must attend the section for which you are registered. No switching is permitted without discussing the matter with the course instructor.

In these sections you will work collaboratively in three-member groups to complete problem-solving exercises. These problem solving activities are an invaluable component of learning physics, and will provide you with much more opportunity to explore problem solving techniques than you will have in class.

During the recitation session, your group will complete a single document to be turned in. This write-up must be submitted by your group before the end of the recitation session and all group members must be present when the report is submitted in person to the recitation instructor. At each recitation session, each student is responsible for writing their own name on the recitation document and initialing the sign-in sheet to verify attendance.

Examinations

All students should plan to take their exams at the scheduled times. Students can request makeup exams only by submitting a valid written (or e-mailed) excuse to the course instructor. In the case of sudden or unexpected events that will cause them to miss an exam, students are required to notify the course instructor prior to the exam or as soon as is reasonably possible.

Exam Policy
There will be two midterm exams and a cumulative final exam (date and time to be set by the Registrar). Exams will be closed book. Relevant physical constants and formulae will be provided in each exam booklet. Students should bring a #2 pencil and a calculator (scientific or graphing) to the exams. Cellular phones, smart phones, any other communication devices, tablet computers, and organizers, and additional paper are not allowed. Room is provided for scratch work in each exam booklet.
The exams will be based on the assigned reading in the textbook, the material covered in lecture, the recitations, the laboratories, and the homework assignments.

Academic Integrity
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.

The University and Departmental policy regarding academic integrity can be found on the course web page with links to the faculty senate policy: http://www.psu.edu/ufs/policies/47-00.html#49-20.

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. Accommodations cannot be graded retroactively for past activities.

Excuse and Makeup policy

Laboratory and Recitation

The laboratory and recitation components of this course are structured around collaborative learning. You must be present in laboratory or recitation to do these assignments. If you are absent from a laboratory or recitation section with a valid excuse, as described under "Valid Excuse Policy," fill out the Makeup appointment form (in Canvas) within one week of the absence. Your score will be recorded as a zero until you makeup the activity. Three (3) makeups are allowed throughout the course for unexcused absences. In circumstances in which you need to miss a fourth assignment, you must contact the course administrator before the absence to discuss the matter or the request will be denied. If you are absent without a valid excuse, a score of zero will be recorded for that assignment. If a student is more than ten minutes late to a recitation or lab, they cannot receive any credit for that period and should request a makeup activity.

Makeups for activities before Midterm 1 are held the week of Midterm 1; makeups for activities between Midterm 1 and Midterm 2 are held the week of Midterm 2; makeups for activities after Midterm 2 are held the last week of classes. Students that do not attend the makeup in the appropriate week will not receive another opportunity to makeup an activity. This structure is necessary because we can only make the materials for ~4 lab activities available at a given time with the space available to PHYS 250.

Homework

You must complete the homework assignments as scheduled. The assignments are available early, so no excuses, including localized technical issues, are accepted. Homework assignments are only extended in extreme circumstances or for students with appropriate university-approved excuses.

Examinations

All students should plan to take their exams at the scheduled times. Conflict exams are provided to students whose academic schedules conflict with our official exam times. Exam times will be provided which allow all students to attend all of the courses in their official PSU schedule and university-approved events without penalty. It is the responsibility of the student to request a conflict exam no later than 1 week prior to the official exam date. These requests are made in the course Canvas page. In the case of sudden or unexpected events that will cause them to miss an exam, students are required to notify the course instructor prior to the exam or as soon as is reasonably possible.

Valid Excuse Policy

Up to three (3) requests for makeups will be accepted for a student throughout the entire course. In extreme circumstances in which a student requires four or more absences to be excused, he or she must contact the course administrator directly to discuss the situation as soon as possible. Requests to be excused from a missed evaluative event due to reasons that are based on false claims is cheating and will be treated as described in the Academic Integrity Policy 49-20 http://science.psu.edu/current-students/Integrity/Policy.html.

The student must provide all requested information on the makeup forms (in Canvas) and electronically sign the form. Incorrect or missing information will result in the request for a makeup activity to be denied.

Family emergencies 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 are considered valid excuses. Please do not force yourself to attend a course activity if you are physically or mentally unwell. Documentation of illness is only requested for prolonged absences or for recurring absences.

To obtain a make up 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 be submitted to the course administrator prior to the absence. The course administrator will setup a plan to keep the student on track and avoid falling behind in course content.

In the case of religious holidays, students should submit the make up request before the date of the absence.

Since University regulations require course instructors to make conflict exams available to students, missing a PHYS 250 laboratory or recitation due to an examination in another course is not considered a valid reason to submit a make up request or attend a different section for the PHYS 250 activity.

You have until one week before the makeups occur to submit a make up request; otherwise it will be denied, barring extenuating circumstance (e.g., no access to the Internet due to reason for absence, such as an extended hospitalization). Once you have signed up for a makeup, it is your responsibility to attend the makeup (you will not be e-mailed a confirmation).