

PHYS 212: General Physics Electricity & Magnetism, General Syllabus

Instructor	Please contact Dr. Costantino for questions djc321@psu.edu
Times	See your course schedule for times & locations
Course Credits	4

Required Text

The text for this course is **Physics for Scientists and Engineers: A Strategic Approach by Knight, 3rd edition**. This course will cover Chapters 25–35. (This book is the 2nd Penn State custom edition.) The softcover PSU custom “split” with these sections, available at the bookstore, also contains access to the MasteringPhysics homework system we will be using in the course.

In addition you are also required to have an i>clicker. These are available from the bookstore and elsewhere. Using your i>clicker in lecture is part of your grade. You can find out about obtaining and registering i>clickers on the [ITS Clicker website](#). There is a link in the Lessons folder to directly register your clicker. If you do not register your clicker, then you cannot earn a lecture participation grade (3% of the total course grade).

Course Description

Calculus-based introduction to classical electricity and magnetism, including such topics as, electric charge and electric fields, Gauss's law, electric potential, capacitance, current, resistance, and circuits, magnetic fields, and fields due to currents, induction and inductance, magnetism of matter, Maxwell's equations, and electromagnetic oscillations. **You must be registered for lecture (PHYS 212), laboratory (PHYS 212L) and recitation (PHYS 212R) to earn a grade in this course.**

Course Objectives

Upon completion of PHYS 212, students should be able to demonstrate a mastery of:

1. Electric Charges, Fields and Forces, specifically
 - a. describing the properties of electric charges such as the types of electric charge, the conservation of charge, quantization of charge, the motion of charges in conductors and insulators.
 - b. using Coulomb's law to determine the force between two electric charges
 - c. relating electric force on a charge and the electric field experienced by the charge
 - d. determining the electric field created by point charges or symmetric distributions of electric charge
 - e. representing the electric field with electric field vectors and electric field lines (and interpreting such diagrams)
 - f. determining the electric force and/or torque on point charges and electric dipoles
 - g. using Gauss' law to relate the flux through a closed surface to the enclosed charge
 - h. describing the electric fields in conductors and determining the charges in and on the surface of conductors in static situations.
2. Electric Potential and Potential Energy, such as
 - a. calculating the electric potential energy of a system of electric charges
 - b. calculating the electric potential energy of an electric dipole in an external electric field
 - c. relating the electric potential energy of a system to the electric potential
 - d. calculating the electric potential at a point given a system of electric charges
 - e. relating the electric potential to the electric field and vice-versa.
 - f. relating the electric potential of a charged system to its charge using capacitance
3. Resistance, Current and Circuits (both DC and AC), including

- a. describing the charge distribution and electric field, and relate the electric field, current density, current, drift speed, and conductivity for a steady state current in a conductor.
 - b. calculating the capacitance of a system (including equivalent capacitance of a system of multiple capacitors).
 - c. calculating the resistance of a linear (Ohmic) system, including equivalent resistance of a system of resistors.
 - d. relating the current through a resistor to the voltage drop across it (Ohm's Law)
 - e. applying Kirchhoff's junction rule and recognizing it as a consequence of conservation of charge.
 - f. applying Kirchhoff's loop rule and recognizing it as a consequence of conservation of energy.
 - g. determining the power output by or dissipated in a circuit element (both DC and AC circuits)
 - h. determining the electric potential energy stored in a capacitor
 - i. determining the magnetic potential energy stored in an inductor.
 - j. describing the behavior of RC circuits.
 - k. describing the behavior of RL circuits.
 - l. describing the behavior of LC circuits.
 - m. employing phasors to represent the relative amplitudes and phases of voltages across and currents through circuit elements in an AC circuit
 - n. calculating the impedance of an AC circuit and relating the current and EMF in using the impedance.
4. Magnetic Fields and Forces, including
- a. interpreting and/or drawing magnetic field line diagrams.
 - b. calculating the magnetic field due to a point charge or current using the Biot-Savart law.
 - c. calculating the magnetic field due to a current using Ampere's Law.
 - d. determining the magnetic force on a moving electric charge or current-carrying wire.
 - e. determining the magnetic force and/or torque on a magnetic dipole, as well as the potential energy of a magnetic dipole.
 - f. recognizing the net magnetic flux through any closed surface is always zero (Gauss' Law for Magnetism).
5. Electromagnetism and Electromagnetic Waves, including
- a. determining the induced electric field, EMF, and/or current due to a changing magnetic flux (Faraday's Law and Lenz's law)
 - b. calculating the magnetic field induced by a changing electric flux ("displacement current") (Ampere-Maxwell's Law).
 - c. describing the properties of plane electromagnetic waves in a vacuum, especially the relationship between the wave's electric field, magnetic field, speed of propagation, and direction of propagation.

Course Requirements

You must be registered for the lecture (212), laboratory (212L) and the recitation (212R)

Problem Set assignments – In general, there is one problem set assignment per week. The due date and time for each assignment appears on MasteringPhysics.

We will be using an online computer grading system called MasteringPhysics

(<http://www.pearsonmylabandmastering.com/northamerica/>) to grade the homework. Note that this special link is only for Phys 212 students. The first time you connect to Mastering physics using this link you will be asked to "link" your Pearson account to your Psu account. You will then need to register for your course. Instructions for this first time setup can be found in the "Lessons tab".

After that, you will be able to access Mastering Physics using your Penn State credentials. Your access code to MasteringPhysics is provided in the PSU custom book in the bookstore or you can buy it online.

Mastering Physics allows you to submit your homework at any time. Your grade on each assignment will be available immediately and, in most cases, you will have multiple tries to arrive at the correct answer. Any work done after the due date will not receive credit and no extensions will be given. Because problem sets are available at least a week before the due date and can be done in advance, **NO excuses are allowed (see bottom of page for more info on excuse policy)**.

Students are encouraged to work together and collaborate on assignments. Work submitted for individual assessment must be the work of the individual student.

Course Prerequisites

Prerequisite: PHYS 211, MATH 140

Co-requisite: MATH 141

Grading Policy

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

Lecture Participation	Homework	Recitation	Laboratories	Midterm 1	Midterm 2	Midterm 3	Final	Content Surveys
3%	10%	10%	10%	15%	15%	15%	20%	2% (+ up to 1% extra credit for post-survey)

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%

The course score will be rounded to the nearest integer (69.49 becomes 69 and 69.5 becomes 70%). No curving of any kind will be employed unless the combined average exam score (computed as the combined average of all students' scores on 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%.

Your clicker score each day is calculated as the sum of your score for the quiz question(s) at the start of class (based on your answer) and your score for the participation questions throughout the rest of the class (based on your participation). The quiz is worth 50 points each day, and the participation questions are worth 50 points each day. If there is no quiz question in a lecture, the participation questions will be worth 100 points on that day. During the first week and review lectures, there might no points for clicker questions.

Your clicker score for the class is calculated by how many of the clicker points you earn in each three week period (Weeks 1 - 3, Weeks 4 - 6, etc.). In the Grades tab, you can find how many points must be earned for a full score in any three week period.

The homework score is calculated as the average of the scores of each homework assignment; all assignments are weighted equally. Each assignment's score is calculated as $100 \times (\text{points earned on assignment} / \text{total points possible on assignment})$. The number of points earned on a problem decreases on each submission after the first. On multiple choice questions, on each submission after the first, credit will decrease by $100\% / (\# \text{ of answer options} - 1)$. On all other questions, on each submission after the first, credit will decrease by 3%.

To earn full credit for the MasteringPhysics problem sets, you need to earn 90% of the points on the assignment.

Concept Surveys: Each student that completes the pre-concept-survey and post-concept-survey will receive 1% towards the final class grade. Students that complete **both concept surveys** will be eligible for **up to** 1% extra credit. Each student's performance on the post-concept-survey will determine how much of the 1% he or she receives (performance on the pre-concept-survey will not be used in calculating the extra credit).

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

Attendance Policy Lecture

You must attend the lecture section for which you are registered ("clicker" participation in a lecture not registered for will not be counted for a grade.) We will use i>clickers in class for three different types of questions in lecture: (1) reading quizzes or review questions at the beginning of each class (graded for correctness), (2) in-class concept questions designed to challenge your thinking (graded for effort), and (3) review of material covered to make sure everyone understands what we just discussed (graded for effort). You can find out about obtaining and registering i>clickers on the [ITS Clicker website](#). 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 Angel (in the Lectures folder) it will automatically register you correctly.

“Clicker questions” are generally multiple choice conceptual questions that are designed to help identify common misconceptions and provide feedback during the class. They are designed to help you know when you understand the topic at hand, and your instructor to know when more discussion is needed and when to move on to the next topic.

Each lecture you will earn points based on your answers to the beginning-of-class reading or review questions, the concept questions, and the review questions. The number of opportunities to earn points in this way is greater than the maximum number of points you can earn. **For this reason, there will be no adjustments for forgetting to bring your clicker to lecture, and no extra-credit or make-up work for absences.** If you fail to register your clicker in a timely manner, you will not get credit for lectures that occurred before you registered your clicker. If you get a new clicker during the semester, be sure to register it right away. 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 212L section (participating in another lecture section will not contribute to your lecture participation grade).

Asking someone to use your clicker and accepting someone's request to use their clicker is an academic integrity violation.

Laboratories

Laboratory sections meet once a week in room 313 Osmond. Your meeting time is determined by your 212 section number. You must attend the laboratory section in which you are scheduled — no switching is permitted.

The laboratories are designed to provide you 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.

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.

Recitation

Recitation sections meet once a week. Your meeting time and room are determined by your 212R section number. You must attend the section for which you are registered. No switching is permitted.

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.

The recitation activities are available in Canvas. While only one paper is turned in, every student needs to bring an individual copy of the pertinent activity to the recitation section.

Conceptual Surveys

You must take the pre- and post-conceptual surveys at the Testing Center. Any student that registers for the course after the first day of the semester must contact the course administrator within a week of adding the course to arrange to take the pre-conceptual survey. In the case of sudden or unexpected events that will cause them to miss one of the conceptual surveys, students are required to notify the course administrator prior to the date of the survey or as soon as is reasonably possible.

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 three midterm exams and a cumulative final exam (date to be set by the Registrar). Exams will be closed book but you are allowed a calculator, though most problems will not involve numerical calculations. Calculators with text-storage capabilities (such as the TI-8x series) or communication capabilities are not allowed during the exams.

Relevant physical constants and formulae will be provided. 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 the 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. Please see the Course Content Objectives and the Exams folder in Angel for more information about the content assessed on the exams in this course.

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.

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

Our goal is for you to succeed and learn some physics. If there is anything that is preventing you from succeeding or anything that you think we can do to help you, please ask. We know that life events can have a huge impact on student's performance.

Please inform the course coordinator Dr. Van Hook as soon as you can if anything is impairing your performance in the class. We may be able to help you.

Penn State welcomes students with disabilities into the University's educational programs. If you have a disability-related need for reasonable academic adjustments in this course, contact the Office for Disability Services (ODS) at 814-863-1807 (V/TTY). For further information regarding ODS, please visit the Office for Disability Services Web site at <http://equity.psu.edu/ods/>.

In order to receive consideration for course accommodations, you must contact ODS and provide documentation (see the documentation guidelines at <http://equity.psu.edu/ods/guidelines/documentation-guidelines>). If the documentation supports the need for academic adjustments, ODS will provide a letter identifying appropriate academic adjustments. Please share this letter and discuss the adjustments with your instructor as early in the course as possible. You must contact ODS and request academic adjustment letters at the beginning of each semester.

Miscellaneous 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 within one week of the absence**. Your score will be recorded as a zero until you makeup the activity. Only three (3) makeups are allowed throughout the course. 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 this is NOT a valid excuse to request a makeup.

Homework

You must complete the homework assignments as scheduled. The assignments are available early so no excuses are accepted. Even technical glitches are not valid excuses.

Examinations

All students should plan to take their exams at the scheduled times. Students can request conflict exams only by filling the conflict exam signup form in the Exams folder. In the case of sudden or unexpected events that will cause them to miss an exam, students are required to notify the course administrator 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 coordinator 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 an academic integrity violation.

- The student must provide all requested information on the Make Up Form and electronically sign the form. Incorrect or missing information will result in the request for a make up 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 coordinator about the family emergency as soon as possible.
- 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 it must be submitted to the make up request dropbox along with the first excuse request before the first absence.
- 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 laboratory due to an examination in another course is not considered a valid make up request.**

You have one week from the absence 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).