Physics 0175
Basic Physics for Students of Science and Engineering 2
Spring Term 2025 (2254) CRN 10804

Lecturer: Prof. Robert P. Devaty
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Office Hours: Thursdays, 4:30 – 5:30 pm, 517 Allen
Fridays, noon – 1 pm, 219 Allen Hall
Zoom within Canvas:
Passcode 15217 (if needed)

Recitation Instructors: Dan Luo
Office: 517 Allen Hall
E-Mail: dal384@pitt.edu

Office Hours: Fridays, 11 am – noon
Fridays, 1 – 2 pm
Resource Room: to be determined

Ryan Koester
Office: PQI B7 (not accessible)
E-Mail: rwk24@pitt.edu

Office Hours: Thursdays, 1 – 3 pm
419 Allen Hall
Resource Room: to be determined

Undergraduate Teaching Assistant (UTA):

Anthony Arshoun
Location: 304 OEH
E-Mail: AJA138@pitt.edu

Hours: Mondays, Wednesdays, 3:00 – 4:00 pm
Tuesdays, Thursdays, 3:00 – 3:30 pm
Email Arshoun for alternative appointments.

Go to Canvas for up-to-date listings of office hours.

Prerequisites: A "C" or greater in PHYS0174 and MATH 0235

Corequisite: Math 0230 (if MATH 0235 is not complete)

Text: **Fundamentals of Physics** (Twelfth Edition) by David Halliday, Robert Resnick and Jearl Walker, Chapters 21-33, 35 – 36. It is important to do the assigned reading **before** the associated lecture. (Note: Since I am not choosing homework problems from the book, any previous edition of Halliday, Resnick and Walker, especially the more recent ones, or any other calculus-based introductory physics text you like will serve the purpose. They all cover the same material, more or less in the same order.) Course topics and learning goals are listed at the end of this syllabus.

Lectures: The lectures are scheduled for 11:00 am – 12:45 pm on Tuesdays and Thursdays in 102 Thaw Hall. Most likely, the lectures will be recorded and made available on Canvas. They might also broadcast synchronously using Zoom (passcode: 15217), the latter provided so that you can "attend" the lecture even if you are ill. There will also be many short (about 5 minutes each) lecture videos available on Canvas, made by Dr. David Nero, which you are welcome to view if you wish. You should read the assigned sections in the textbook and/or view the lecture videos before lecture. There will be concept quizzes (reading quizzes) to try to identify which aspects of the material you understand and which should be emphasized during the lectures. Long uninterrupted lectures are known to not be very effective for learning, so I would like the lectures to be focused and relatively brief episodes in the midst of student activities such as group problem solving, "clicker questions" using Top Hat, etc. Lecture activities will count for credit to the extent that performance can be recorded using Top Hat.

Homework: Homework will be assigned weekly using Achieve. It is your responsibility to do the homework before your recitation section as preparation for the weekly quizzes. Understanding the concepts and applying them to solve problems are essential for

successful performance on the quizzes and exams. To access Achieve, see the instructions on Canvas.

Recitation: Your recitation section provides the opportunity to ask questions and discuss the material in a smaller group. You will also benefit from the alternative viewpoint of the recitation instructor. The intended format for the recitation is:

- Quick review of recent material (5-10 minutes)
- Questions / discussion / problem solving (25-30 minutes). It is highly desirable that most of the recitation period be used for active learning. For example, the recitation instructor can break up the group into smaller groups to do work sheets or guided problems or ask students to work out problems on the board.
- Weekly group quiz (10-15 minutes)

Your recitation grade will be based on the quizzes. Most likely, your lowest quiz score will be dropped, so you can miss one recitation without penalty. There will be no recitation quiz during exam weeks. The recitation sections are:

Wednesdays 12:00 – 12:50 pm	106 Allen Hall	Ryan Koester
Wednesdays 1:00 – 1:50 pm	106 Allen Hall	Dan Luo
Thursdays 10:00 – 10:50 am	115 Victoria	Dan Luo

Canvas Site: There is a Canvas site associated with this course. It can be accessed through your my.pitt.edu account. This site will be used to make important announcements (E-mail will also be used) and to make materials available such as lecture recordings with slides, videos, tutorials, practice exams, etc. Homework and Reading Quizzes will be handled using Achieve.

Examinations: There will be three 50-minute in-class examinations, given during regular lecture periods. The scheduled dates, all Thursdays, are February 6. March 13, and April 10. The comprehensive departmental final examination is scheduled for Tuesday, April 29, 2:00 – 3:50 pm, at a location to be determined.

Grading: Your letter grade will be based on the following percentages:

• In-class Exams	40%
• Final Exam	20%
• Homework (Achieve)	10%
• Recitation Quizzes	10%
• Reading Quizzes	10%
• Top Hat Lecture Questions	10%

Roughly, A: 90 – 100%, B: 80 – 90 %, C: 70 - 80%, etc., although some fine tuning is likely (on the more generous side). You won't earn the grade you expect based on your exam scores if you don't also perform well on the four non-exam elements, which tend to have higher averages than the exams.

Help: There are many resources available for help in addition to the regular office hours of the instructor and teaching assistant. These include:

- "Resource Room" (on-line or in-person, 509 Allen Hall): This room is staffed by graduate student teaching assistants for the introductory physics and astronomy courses. The hours will be posted on the departmental website. The link is: http://www.physics.pitt.edu/resource-room .

- UTA Peer Tutor: Anthony Arshoun (see above)
- Study-Lab (G-1 Gardner Steel Conference Center, 412-648-7920) offers various resources, including peer tutoring: https://asundergrad.pitt.edu/study-lab
- A variety of resources available to students are found here: https://pitt.libguides.com/assistanceresources
- If you wish to hire a private tutor, contact the Physics departmental office, 100 Allen Hall.
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Academic Integrity

Students in this course will be expected to comply with the University of Pittsburgh's Policy on Academic Integrity. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and programmable calculators.

To learn more about Academic Integrity, visit the Academic Integrity Guide for an overview of the topic. For hands- on practice, complete the Academic Integrity Modules.

Disability Services

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and Disability Resources and Services (DRS), 140 William Pitt Union, (412) 648-7890, drsrecep@pitt.edu, (412) 228-5347 for P3 ASL users, as early as possible in the term. DRS will verify your disability and determine reasonable accommodations for this course. If you take exams at DRS you must make the arrangements for each exam well in advance.

Diversity and Inclusion

The University of Pittsburgh does not tolerate any form of discrimination, harassment, or retaliation based on disability, race, color, religion, national origin, ancestry, genetic information, marital status, familial status, sex, age, sexual orientation, veteran status or gender identity or other factors as stated in the University's Title IX policy. The University is committed to taking prompt action to end a hostile environment that interferes with the University's mission. For more information about policies, procedures, and practices, visit the Civil Rights & Title IX Compliance web page.

I ask that everyone in the class strive to help ensure that other members of this class can learn in a supportive and respectful environment. If there are instances of the aforementioned issues, please contact the Title IX Coordinator, by calling 412-648-7860, or e-mailing titleixcoordinator@pitt.edu. Reports can also be filed online. You may also choose to report this to a faculty/staff member; they are required to communicate this to the University's Office of Diversity and Inclusion. If you wish to maintain complete confidentiality, you may also contact the University Counseling Center (412-648-7930).

E-Mail Communication

Each student is issued a University e-mail address (username@pitt.edu) upon admittance. This e-mail address may be used by the University for official communication with students. Students are expected to read e-mail sent to this account on a regular basis. Failure to read and react to University communications in a timely manner does not absolve the student from knowing and complying with the content of the communications. The University provides an e-mail forwarding service that allows students to read their e-mail via other service providers (e.g., Hotmail, AOL, Yahoo). Students that choose to forward their e-

mail from their pitt.edu address to another address do so at their own risk. If e-mail is lost as a result of forwarding, it does not absolve the student from responding to official communications sent to their University e-mail address.

Copyright Notice

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See Library of Congress Copyright Office and the University Copyright Policy.

Statement on Classroom Recording

To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student's own private use.

Your Well-being Matters

College/Graduate school can be an exciting and challenging time for students. Taking time to maintain your well-being and seek appropriate support can help you achieve your goals and lead a fulfilling life. It can be helpful to remember that we all benefit from assistance and guidance at times, and there are many resources available to support your well-being while you are at Pitt. You are encouraged to visit Thrive@Pitt to learn more about well-being and the many campus resources available to help you thrive.

If you or anyone you know experiences overwhelming academic stress, persistent difficult feelings and/or challenging life events, you are strongly encouraged to seek support. In addition to reaching out to friends and loved ones, consider connecting with a faculty member you trust for assistance connecting to helpful resources.

The University Counseling Center is also here for you. You can call 412-648-7930 at any time to connect with a clinician. If you or someone you know is feeling suicidal, please call the University Counseling Center at any time at 412-648-7930. You can also contact Resolve Crisis Network at 888-796-8226. If the situation is life threatening, call Pitt Police at 412-624-2121 or dial 911.

Learning Goals

Overall

- State, both in words and equations, the laws of electromagnetism. Explain their meanings and give examples of situations to which they apply.
- Recognize and effectively make use of the terminology associated with electromagnetic theory.
- Work with various representations of physical laws, including conceptual, graphical, and equations, and be able to transfer between representations as necessary to analyze and solve specific problems/situations.
- Use relevant mathematics, including vector algebra, vector calculus, systems of linear equations, etc., as a tool to express the relevant laws of physics and apply them to specific situations.
- Break up a complex problem or situation into simpler parts.
- Recognize the relevance of and make use of other laws of physics, including Newton's Laws and the laws of thermodynamics, along with the laws of electromagnetism, if necessary to analyze and solve a given problem/situation.
- Apply relevant physical laws and mathematics to formulate a strategy and then solve a given problem (towards the goal of recognizing the relevance of the material covered in this course to other fields in science and engineering, and to everyday life, and be able to take advantage of

your acquired skills to analyze situations and apply the laws of physics to gain insight and make predictions).

Topic/Chapter Specific

The following list was developed by a departmental committee. I have classified them according to the relevant chapters in the textbook, the 12th edition of Halliday, Resnick and Walker. I will include learning objectives in the lecture slides. Note that the book lists learning objectives at the beginning of each chapter and section.

Chapter 21: Coulomb's Law

- Use Coulomb's law to calculate the forces between two or more point charges.
- Describe how charge redistributes itself as conductors are touched to insulators, other conductors, and/or grounded.

Chapter 22: Electric Fields

- Calculate the electric field due to one or more point charges.
- Integrate to find the electric field due to an extended charge distribution (line, arc, or ring).
- Describe the behavior of a dipole placed in an electric field (in terms of torque and potential energy).

Chapter 23: Gauss's Law

- Find the electric field due to a symmetric extended charge distribution using Gauss's law. Alternately, determine the amount of induced charge on the surface(s) of a conductor.

Chapter 24: Electric Potential

- Calculate the electric potential due to a system of point charges.
- Sketch the electric field and/or potential for a charge distribution.
- Integrate to determine the electric potential from a continuous charge distribution (line, arc, or ring).
- Use the relationship between electric potential and electric field to convert from one to the other.
- Determine the potential energy of (or the work needed to assemble) a system of charges.

Chapter 25: Capacitance

- Find the energy stored in a capacitor's electric field.
- Describe the effects of dielectrics on capacitors in terms of the electric field, capacitance, and energy stored in the capacitor.
- Determine the charge, capacitance, or voltage of one or more capacitors in series and parallel.

Chapter 26: Current, Resistance, Power

- Convert between current, current density, and drift velocity.
- Apply the definitions of resistance and resistivity, and convert between the two.
- Find the power dissipated by a resistor in a circuit.

Chapter 27: Kirchhoff's Laws, Circuits, RC Circuit

- Apply Kirchhoff's laws to a single-loop or multi-loop circuit to find the current(s). Circuits may include ideal or real batteries.
- Calculate the voltage between two points in a circuit.
- Determine the equivalent resistance, current, or voltage for resistors in series and parallel.
- Find the time constant, current, and/or voltage of a capacitor in an RC circuit at a particular time.

Chapter 28: Magnetic Field and Magnetic Force

- Find the force on a moving charged particle due to a magnetic field.
- Apply the ideas of crossed fields and/or centripetal motion to solve for an unknown given a set of measurable quantities. Examples include Tompson's apparatus and the Hall effect.
- Determine the magnitude and direction of the force acting on current carrying wires.

Chapter 29: Calculating the Magnetic Field: Biot-Savart Law, Ampere's Law

- Calculate the magnetic field of one or more wires (including solenoids and toroids) using the Biot-Savart Law or Ampere's Law.
- Sketch the magnetic field of one or more wires (including solenoids and toroids).

Chapter 30: Faraday's Law of Induction; Inductors; RL, LC and RLC Circuits

- Calculate the magnitude and direction of an induced current from a changing magnetic flux.
- Determine the inductance or mutual inductance of a system.
- Find the current at a particular time in an RL circuit.
- Calculate the energy stored in the capacitor/inductor in an LC or undriven RLC circuit.

Chapter 31: LC Oscillations, Series RLC Circuit, Phasor Method, Transformers

- Find resistance, capacitance, inductance, reactance, impedance, phase angle, power factor, current amplitude, and/or voltage amplitude in an RLC circuit.
- Know the relationships between phase, resonance, and terms like "capacitive."
- Determine the average power produced by a generator and/or dissipated by one or more resistive loads.
- Calculate the voltage, current, and/or equivalent resistance transformations of an ideal transformer and identify the circumstances where maximum power is transferred from a source to a load.

Chapter 32: Displacement Current, Maxwell's Equations

- Calculate the displacement current and/or induced magnetic field from a changing electric flux.

Chapter 33: Electromagnetic Waves, Reflection and Refraction, Polarization

- Determine the energy transported by an electromagnetic wave and/or the amplitudes of the electric and magnetic fields.
- Calculate the angle of reflected and/or refracted light rays, and identify total internal reflection.
- Evaluate the intensity of a light source after it passes through one or more polarizers. The light source could be polarized by reflection at Brewster's angle.

Chapter 35: Interference: Double Slit, Thin Film

- Locate the maxima or minima caused by double-slit interference (could be combined with diffraction).
- Calculate the effects of interference from a thin film.

Schedule:

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Jan. 5	6	7	8 Classes begin EMCS	9 Lec 1	10	11
12	13	14 Lec 2	15 Quiz 1	16 Lec 3	17	18
19	20 MLK	21 Lec 4 Add/drop ends	22 Quiz 2	23 Lec 5	24	25
26	27	28 Lec 6 Extended frop ends	29 Quiz 3	30 Lec 7	31	1
Feb. 2	3	4 Lec 8	5 Exam 1	6 Lec 9 Exam 1	7	8
9	10	11 Lec 10 Final Exam Conflict Form Deadline; monitored withdrawal deadline	12 Quiz 4	13 Lec 11	14	15
16	17	18 Lec 12	19 Quiz 5	20 Lec 13	21	22
23	24	25 Lec 14	26 Quiz 6	27 Lec 15	28	1
Mar. 2 Spring Recess	3	4	5	6	7 Spring Holiday	8
9 Spring Recess Daylight Saving	10 Ramadan begins	11 Lec 16	12 Exam 2	13 Lec 17 Exam 2	14 Spring holiday	15
16	17	18 Lec 18	19 Quiz 7	20 Lec 19	21	22
23	24	25 Lec 20	26 Quiz 8	27 Lec 21	28	29
30	31 Eid al-Fitr	1 Lec 22	2 Quiz 9	3 Lec 23	4	5
Apr. 6	7	8 Lec 24	9 Exam 3	10 Lec 25 Exam 3	11	12 Passover
13	14	15 Lec 26	16 Quiz 10	17 Lec 27	18 Good Friday	19
20 Easter	21	28 Last class	23 Reading Day	24	25	26
27	28	29 Final Exam 2-3:50 pm	30	1	2	3 Grades Due
May 4	5	6	7	8	9	10

Another version of the schedule appears below. It does not include the due dates for Achieve Reading/Concept Quizzes, which can be found in Canvas and Achieve. It is possible that due dates will be adjusted a bit during the course.

Week	Dates	Topics	Reading	Concept Quizzes	Recitation	Homework	Exams
1	Jan. 8-11	Coulomb's Law	21	1	EMCS		
2	Jan. 12-18	Electric Field	22	2, 3	Quiz 1: Electric Force	HW 1 1-18	
3	Jan. 19-25	Gauss's Law	23	4, 5, 6	Quiz 2: Electric Field	HW 2 1-25	
4	Jan. 26-Feb. 1	Electric Potential	24	7, 8, 9	Quiz 3: Gauss's Law	HW 3 2-1	
5	Feb. 2-8	Capacitance	25	10		HW 4 2-8	Exam 1
6	Feb.9-15	Current and Resistance	26	11, 12, 13	Quiz 4: Capacitance	HW 5 2-15	
7	Feb. 16-22	Circuits	27	14, 15, 16	Quiz 5: Current and Res	HW 6 2-22	
8	Feb. 23-Mar. 1	Magnetic Field and Force	28	17, 18	Quiz 6: Circuit Analysis	HW 7 3-1	
Spring Break							
9	Mar. 9-15	Biot-Savart Law, Ampere's Law	29	19, 20			Exam 2
10	Mar. 16-22	Electromagnetic Induction	30	21, 22, 23	Quiz 7: Magnetic Field	HW 8 3-22	
11	Mar. 23-29	LC Oscillations, AC Circuits	31	24, 25	Quiz 8: Faraday's Law	HW 9 3-29	
12	Mar. 30-Apr. 5	Maxwell's Equations, Electromagnetic Waves	32, 33	26, 27	Quiz 9: AC Circuits	HW 10 4-5	
13	Apr. 6-12	Light	33	28			Exam 3
14	Apr. 13-19	Interferemce	35	29, 30	Quiz 10: Light	HW 11 4-16	
15	Apr. 20-28	Diffraction	36	31, 32		HW 12 4-23	
Final Exam: Apr. 29, 2:00 - 3:50 pm							