

Physics 212 - College Physics II (3 cr)

Session: Spring 2025

Instructor: Prof. John B. Buncher (he/him)

Office: South Engineering 317

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Office Hours: MTWTh 10 AM – 11 AM,

Class Meetings: TTh 2:00 PM – 3:15 PM

Lecture Location: AGHILL 112

Final: Wednesday, May 14, 2025, 8:00 AM – 10:00 AM, AGHILL 112

Prerequisites: PHYS 211

Course Materials

- The primary text for the course will be “College Physics: Reasoning & Relationships - 2nd Edition, Vol. 2”, by Giordano, published by Brooks/Cole.
- A “Clicker” (either the Echo360 app or logging into the PointSolutions site) for answering in-class questions
- The homework for the course will be done through LON-CAPA (http://www.ndsu.edu/physics/students/lon_capa).
- Course materials (lecture slides, handouts, solutions) will be posted on the course Blackboard page. You can log in to Blackboard at <https://blackboard.ndus.edu/>
- A scientific calculator will be required to complete homework assignments and exams.
- A #2 pencil for taking exams.

Course Description

From the NDSU Catalog Course Description: Second course for students without a calculus background. Includes electricity, magnetism, optics and modern physics. Prereq: PHYS 211, PHYS 211L.

This course will explore the question “How do charged particles interact?” In Physics 211 (Mechanics), you have studied what happens when objects interact (using the concepts of force, momentum, energy, etc.), but generally did not address the question of where those forces came from! In this course we will study how particles with electric charge interact through electric fields, magnetic fields, and electromagnetic waves in order to construct what the forces are that act on charged particles. We can then use our mechanics knowledge to predict the motion of the charged particles under the influence of those interactions. We will also study what is perhaps the most prevalent use of electric and magnetic fields, that of electric circuits and their components, as well as the properties of light through both ray and wave optics.

Course Objectives

The primary goal of this course is to provide the students with an understanding of the basic principles of electromagnetism and optics that will aid them in their everyday lives and careers as informed members of

society and in other courses. The students should attain a conceptual understanding and problem-solving ability such that they can readily apply their knowledge to novel problems and situations. Specifically, students shall be able to:

- Reason qualitatively & quantitatively about the electric and magnetic forces that charges exert on each other, using a few foundational principles.
- Apply laws of energy conservation and charge conservation to simple electric circuits, and be able to predict the short- and long-term behavior of the circuit.
- Apply optics principles to predict properties of image formation using mirrors and lenses.

Course Policies

COVID-Related Policies

Please **do not come to class**

- if you are feeling ill, particularly if you are experiencing COVID-19 symptoms, or
- if you are infected, during your five-day isolation period.

You will still need to complete the assignments, exams, reading, etc. necessary to meet class learning objectives. You can complete missed work by turning in assignments when you are no longer ill, and scheduling a time to make up any missed exams.

Grades

Your final grade will be determined according to the following weights and cutoffs:

Clicker Questions	6%	A	88 %
Reading Quizzes	10%	B	78 %
Weekly Homework	30%	C	68 %
Midterms	18% (3 midterms, drop lowest)	D	58 %
Final	18%	F	< 58 %

Your **LOWEST** score of the **THREE MIDTERM EXAMS** will be **DROPPED**. I reserve the right to *lower* the grade cutoffs listed above, however they will not be raised.

Note that exams make up 54% of your final score! It is crucial that you prepare and study accordingly.

If you participate in 85% of all clicker questions, you will receive the full 5%. Clicker questions are **NOT** graded for correctness.

Homework

We will use the LON-CAPA on-line homework system for assignments this semester. Each week will have (roughly) 2-3 on-line Reading Quizzes and one on-line Weekly Homework due. Additionally, you are expected to read the assigned sections of the text and work any suggested problems *before* class so that you are prepared to ask and answer questions in lecture.

Late Policy: For Weekly Homework and Reading Quizzes, the deadlines are mostly there so you know how to pace yourself in the course. It is important to stay on top of assignments and come in for assistance on things you find challenging in order to succeed. That said, I know that “life happens”. If you need an extension, please let me know and we can work something out. Please be aware that if you wait too long to contact me, there might not be much that can be reasonably done to make up material. Contact me as soon as you are able!

Out of Class Time

The university defines that a student with adequate preparation should spend 3 hours per credit on the course each week in order to earn an average grade in the course. You should aim higher than “average student, average grade”, so expect to spend more than 6.5 hours per week (3 hours per credit times 3 credits minus two 75 minute lectures) on this course each week outside of class.

Attendance & Participation

According to [NDSU Policy 333 www.ndsu.edu/fileadmin/policy/333.pdf](http://www.ndsu.edu/fileadmin/policy/333.pdf), attendance in classes is expected. Veterans and student service members with special circumstances or who are activated are encouraged to notify the instructor as soon as possible and are encouraged to provide Activation Orders.

To succeed in this course it is crucial that you attend the lecture and prepare accordingly. In order to receive the the most out of lecture, you must arrive *on-time* and be prepared for that day’s class. Preparation includes (but is not limited to):

- Reading the assigned sections of the text
- Providing feedback in the on-line reading quizzes
- Working the assigned problems
- Bringing the text and any posted lecture slides to class

Additionally, when the class is asked a question (or asked to do something in groups), you are to make every effort to come up with an answer. In-class questions are designed to get you to think, so when answering do not worry about getting the *wrong* answer, if you knew everything already you would not need to enroll in the course!

Labs

The laboratory companion to this class is considered a separate course. Students taking the lecture are not required to enroll in the lab course. Your grade in the lab does not affect your grade in this course (and your grade in this course does not affect your grade in the lab). The first meetings of PHYS 212L will be held the week of January 20th.

Exams

Exams will be closed-book and taken during lecture. You are not allowed to work with other students on the exams. Any topic covered in class, the reading assignments, or the homeworks may appear on the exam. Details of the format of the exams will be covered closer to the exam time.

Missed Exam Policy: Missed will normally be given zero credit. Official exceptions will be accepted (illness, family emergency, official university function, etc.).

Help Hours (Office Hours)

You are highly encouraged to make use of my Help/Office Hours (listed on the front of the syllabus). Help Hour times may change as the semester progresses, and you will be notified if they do. If you cannot meet during those times, email me and we should be able to work something out. During help hours, we can discuss anything that you wish (homework, grading, concepts, exams, topics of interest, etc.). Usually students come in for help on a particular problem, and I am happy to help them with it. Other times students will just work on problems in small groups and then ask me a question when they get stuck, which is also welcome!

Accommodations

Any students with disabilities or other special needs, who need special accommodations in this course, are invited to share these concerns or requests with the instructor and contact the [Disability Services Office](http://www.ndsu.edu/disabilityservices/) <http://www.ndsu.edu/disabilityservices/> as soon as possible.

Feedback

If you have any concerns about the course or suggestions on how it may improve, please let me know! I am happy to consider and implement student suggestions, and I have had success implementing such suggestions in previous courses.

On Academic Dishonesty

The academic community is operated on the basis of honesty, integrity, and fair play. [NDSU Policy 335: Code of Academic Responsibility and Conduct](#) applies to cases in which cheating, plagiarism, or other academic misconduct have occurred in an instructional context. Students found guilty of academic misconduct are

subject to penalties, up to and possibly including suspension and/or expulsion. Student academic misconduct records are maintained by the [Office of Registration and Records](#). Informational resources about academic honesty for students and instructional staff members can be found at www.ndsu.edu/academichonesty.

You are highly encouraged to work with your fellow students, and to seek out their assistance or the assistance of the instructor, in all of your studies. Working with another person is highly beneficial for both people when there is a healthy working relationship. However, whatever you turn in must be your own work and words. Copying someone else's work and turning it in as your own is a case of academic dishonesty. While we are using LON-CAPA for the homework this semester, the answers you enter still need to represent your own work. You are not permitted to collaborate with anyone else on exams.

If you have any questions about what constitutes academic dishonesty it is your responsibility to ask before the assignment is due.

Need Additional Help?

If you would like additional help outside of office hours, then you are in luck! Free individual drop-in tutoring is available in the Physics Department tutor room (South Engineering, 2nd floor, just before you go *up* the stairs) and from NDSU's ACE program (http://www.ndsu.edu/studentssuccess/tutoring_schedule/). I will post the Physics Department tutor room hours as soon as they are available. Please use one of the tutoring resources if you have a large number of questions.

Advice

Here are some helpful tips for success in the course, from my own personal experience and suggestions of other professors.

1. **Work every day:** It is crucial that you keep up with the material and to develop your conceptual understanding. Working a little bit every day will get you much farther than working for a long time once a week or so. You will often need to read the problems, think about them, and then come back to them later once you've had a chance to reflect on them.
2. **Practice:** Physics cannot be learned simply by reading, attending lecture, and memorizing the pages of your physics text. The single best way to learn physics is to *do* it, by practicing via the in-class exercises, lab work, homework, the workbook, etc. This will help get you ready for the exams!
3. **Ask for Help:** Help is available through me via my office hours (or by appointment, or by email), drop-in departmental tutoring, your fellow students, and private tutoring.
4. **Read Before Lecture:** That way, you're seeing the material for the second time, and are much better prepared to ask questions on things you're having trouble understanding.
5. **Read Critically:** Ask questions and take notes! If something is not clear, make a note of it so you can ask in class. You should also be working through steps done (or omitted) in class and the text. As a friend of mine once said; "The exam will NOT ask if you agree with our solution, but will ask you to come up with your OWN solution."
6. **Use Time Effectively:** If you've been stuck on one problem for 30 minutes, switch to another one (which may cause you to think about the troublesome one in a different way), or seek assistance. That

being said, do not despair if it is not obvious what to do after 5 minutes of thinking. These problems will require some extra thought.

7. **Don't Panic:** Physics is challenging. Like anything else worthwhile, it will take practice and perseverance to succeed, but the rewards of understanding how the universe works at a deeper level are well worth it.

Additional Resources for Students

It is *normal* to feel overwhelmed at the best of times, but especially now. As a member of the NDSU community, resources are available for you should you need help in dealing with adverse reactions to things happening in the world today. A variety of resources are listed below:

For students on campus and remotely (telehealth):

Counseling Services: 701-231-7671; <https://www.ndsu.edu/counseling/>

Disability Services: 701-231-8463; <https://www.ndsu.edu/disabilityservices/>

Student Health Service: 701-231-7331; <https://www.ndsu.edu/studenthealthservice/>

Dean of Students Office: 701-231-7701; <https://www.ndsu.edu/deanofstudents/>

In a crisis or emergency situation: Call University Police: 701-231-8998

Call 9-1-1

Go to a Hospital Emergency Room

Go to Prairie St. Johns for a Needs Assessment: 701-476-7216 (510 4th St. S.)

Call the FirstLink Help Line: 1-800-273- TALK (8255) or 2-1-1

Call Rape and Abuse Crisis Center: 701-293-7273

Course Schedule

Due to trying out the “frequent exams” structure for the first time this semester, this schedule is highly tentative. *More* exams may be needed if the instructor or a significant number of the students feel it would be beneficial, and this document will be updated accordingly.

Date	Topic	Reading Due	Homework Due
T 1/14	Intro & Charge Model	-	-
Th 1/16	Electric Force, Coulomb's Law	17.1 – 17.2	-
T 1/21	Electric Field & Field Lines	17.3	HW 1 Due
Th 1/23	Charge Transfer, Electric Flux	17.4 – 17.5	-
T 1/28	Gauss's Law & Symmetry	17.5 – 17.7	HW 2 Due
Th 1/30	Work & Electric Potential Energy	18.1	-
T 2/04	Electric Potential (Voltage)	18.2	HW 3 Due
Th 2/06	Equipotentials, Electric Potential & Electric Field	18.3	-
T 2/11	Capacitors & Combinations	18.4	HW 4 Due
Th 2/13	Exam 1	-	-
T 2/18	Dielectrics, Current	18.5 – 18.8, 19.1 – 19.2	HW 5 Due
Th 2/20	Voltage, Resistance, Loop Rule	19.1 – 19.4	-
T 2/25	Kirchoff's Rules, Power, Resistor Combinations	19.4	HW 6 Due
Th 2/27	RC Circuits	19.5 – 19.9	-
T 3/04	Magnetic Fields, Magnetic Force	20.1 – 20.3	HW 7 Due
Th 3/06	Exam 2	-	-
T 3/11	NO CLASS - SPRING BREAK	-	-
Th 3/13	NO CLASS - SPRING BREAK	-	-
T 3/18	Magnetic Forces on Wires	20.4 – 20.5	HW 8 Due
Th 3/20	Hall Effect & Magnetic Applications	20.6 – 20.9	-
T 3/25	Magnetic Flux, Lenz's Law, Faraday's Law	21.1 – 21.2	HW 9 Due
Th 3/27	Faraday's Law, Inductance	21.3 – 21.4	-
T 4/01	RL Circuits, Applications	21.5 – 21.7	HW 10 Due
Th 4/03	EM Waves & Spectrum	23.1 – 23.4	-
T 4/08	Catch-Up	HW 11 Due	-
Th 4/10	Exam 3	-	-
T 4/15	Ray Model, Snell's Law, Image Formation	24.1 – 24.3	-
Th 4/17	Curved Mirrors & Lenses	24.4 – 24.5	-
T 4/22	Optics & The Eye	24.6, 26.1	HW 12 Due
Th 4/24	Wave Model & Interference	25.1 – 25.2	-
T 4/29	Thin Films	25.3	HW 13 Due
Th 5/01	The Nucleus, Nuclear Decays, Half-Life	30.1 – 30.2	-
T 5/06	Nuclear Reactions, Biological Effects	30.4 – 30.5	HW 14 Due
Th 5/08	Catch-Up	-	-
T 5/13	-	-	HW 15 Due
Th 5/14	Final Exam - 8:00 AM – 10:00 AM	-	-