

Syllabus for General Physics II, PHYS 212X

Spring 2022

Lecture
MWF 10:30-11:30 PM, REIC 201

Laboratory
REIC 257

F01, 35003, M 2:15-5:15 PM

F02, 35004, T 9:30-12:30 PM

F03, 35005, W 2:15-5:15 PM

F04, 35006, R 2:15-5:15 PM

F05, 35007, R 6:00-9:00 PM

- Course:** PHYS 212X
- CRN:** 35008
- Course Type:** In person classroom teaching and Laboratory
- Instructor:** Ataur R. Chowdhury
- Office:** REIC 118
- Office Hours:** MW 2:00-3:30 PM
- Contact:** Phone (907) 474-6109
Fax (907) 474-6130
Email archowdhury@alaska.edu
- Prerequisites:** Concurrent enrollment in MATH 202X; PHYS F211X or ES 208 or concurrent enrollment in ES 210; placement in ENGL F111X or higher; or permission of instructor.
- Texts:** Physics for Scientists and Engineers: A Strategic Approach, Randall D. Knight, 4th Edition, Pearson.
- Course Objectives:** To acquire a basic understanding of (i) the fundamentals of heat and thermodynamics; (ii) the concepts of electricity and magnetism; and (iii) Maxwell's equations and electromagnetic waves.
- Course Outline:** **Heat, temperature, laws of thermodynamics, Coulomb's Law, Gauss's Law**, electrical potential, **electrical energy**, capacitance, Kirchhoff's Laws, Biot-Savart Law, **Faraday's Law, Maxwell's equations**, and electromagnetic waves.

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The **highlighted** topics will form the major focus of this course, and the students will be assessed for the mastery of these concepts through homework, quizzes, labs, and tests.

Student Learning Outcomes:

1. Understand the basics of heat and thermodynamics.
2. Apply thermodynamic laws to physical problems.
3. Understand the basic concepts of electricity and magnetism.
4. Learn how to build and analyze simple electric circuits.
5. Acquire basic knowledge of Maxwell's equations and their simple applications.
6. Describe the societal relevance of physics and its connection to other fields of science.
7. Ability to safely use basic laboratory equipment, to develop a testable hypothesis, to systematically collect and analyze data, and to report and interpret experimental results.

Instructional methods: Interactive lecture based instruction

Credits: 4 credits: 3 hr. of lecture, and 3hr. of lab per week.

Help Session: Help with homework and lab is available through the teaching assistants (TAs) during the hours posted on the door of REIC 122.

MTWR: TBA (REIC 122)

Additional help with homework is available through the instructor during his designated office hours.

Course Requirement and Policies:

Class Attendance:

For a better understanding of the course material attendance and participation in classroom activities are very important. This particular course is generally regarded as one of the basic courses that deal with the fundamentals of classical physics, and it is highly expected that the students will commit themselves to attend the class regularly. There will be supplemental materials for this course and the students will be held responsible for all the materials that will be brought in from outside the text. The students will be expected to take part in meaningful discussion and ask questions to better comprehend the subject material. **It is highly expected that the students will cause least disruption of class activities by showing up before the class starts, not leaving the**

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class before it stops, keeping cell phones in silent mode, and refraining from talking during the class.

Homework:

On the average, 8-12 problems/exercises/questions will be assigned each week on Fridays. The homework will be due back by 5:00 PM on Fridays the following week. There is a designated drop-box for PHYS 212X homework inside Physics office (REIC 102). **NO LATE HOMEWORK WILL BE ACCEPTED. NO EXCEPTIONS** (barring emergencies and extreme situations). Group work is highly encouraged for solving problems, and for additional help with the homework the students are most welcome to consult the instructor during the office hour or any other time by prior appointment. Any homework you submit should reflect your own best effort. Copying of homework is absolutely not acceptable and will result in a grade of zero for the assignment.

Quizzes: There will be one quiz every week of the semester on Fridays, except the first week and the week of the midterm. These quizzes will be administered during the last 15-20 minutes of the class and are designed to test students' understanding of the subject material covered during the preceding week. The quiz may include problems similar to the homework, those worked out in class, and may also include 'intuitive' questions pertaining to the subject material covered during the previous week. **Make-up quizzes, for valid reasons, may be arranged with approval from the instructor.**

Examinations:

There will be a midterm examination (February 21, Monday, 10:30-11:30 AM) and a final comprehensive examination (April 28, Thursday, 10:15-12:15) for this course. Examinations will consist of, in most part, material similar to those in the homework, quizzes, and those covered in class. Midterm will cover the material covered in class and homework prior to the date of test, and the final will be comprehensive and will include all material covered in the semester, with more weight on material covered after the midterm. **Make-up exams, for valid reasons, may be arranged with approval from the instructor.**

Laboratory:

The laboratory is an integral part of this course, and each student must register for and attend the lab section and perform all ten labs that are listed in this handout. All labs and reports must be completed. Every effort must be made to make up a lab during the same week if possible. Last week of the semester would be set aside for makeup lab. Lab reports must be turned in on time, any lab turned in late will get deducted 20% for each week after the date it is due. **A PASSING GRADE IN THE LAB IS REQUIRED TO PASS THE COURSE.** For details about the lab, please consult the lab policy posted on the blackboard by the lab instructor Beth Robert.

Paper:

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PHYS 212X is one of the core courses under the natural science component of UAF Core Curriculum, and the intended goal of any natural science core courses is to prepare students for lifelong learning in natural sciences. The basic premise of these courses is to educate our students for making decisions based on “scientific method” and this entails making informed decision based on experimental observations. For this course, the students will learn this method by doing hands-on laboratory exercises during their laboratory sessions. The students will collect data, perform statistical analysis of the data, and draw conclusions following “scientific method” that is appropriate for physics and perhaps for all physical sciences.

A second expectation of Core courses, the so called “science and society”, is related to scientific knowledge as it applies to public policies and issues. The students will be exposed to some illustrative examples in class to study the interplay between sound scientific knowledge and resulting public policies. These examples should help students with decision-making processes that involve scientific data, and should help to sharpen their abilities as how to scientific knowledge applies to develop public issues/policies and how some of the policies/issues were put in place without any sound scientific reasoning. Every student, working individually or in groups, will pick a topic of highly debated current societal issues that relate to physics, such as global warming, nuclear energy, etc, discuss both pros and cons of the issue based on scientific data, and draw conclusion about public policy of such an issue. A detailed outline of the paper will be provided later during the semester.

Academic Honesty:

UAF expects and requires academic honesty from all members of the University community, and takes any act of plagiarism and cheating seriously. It is expected that all assignments, including homework and reports, that are turned in for this course must be the original work of the individual student. Failure to comply with this policy will result in penalty as stipulated under UAF regulations.

Course Evaluation:

The final grade for this course will be based on student’s performance on homework and final, and will be weighted as follows.

Homework	17%
Lab	15%
Paper	10%
Quizzes	18%
Midterm	15%
<u>Final</u>	<u>25%</u>
Total	100%

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The final grading for this course will be based on a curve. For a given score, your letter grade will not be lower than what it would be expected based on standard grading scale (90-100 = A, 80-90 = B, etc.). Allowed grades are limited to letter grades A,B,C,D,F,I,BN, and no plus-minus grades will be given for this course.

Incomplete Grade Policy: “The letter “I” (Incomplete) is a temporary grade used to indicate that the student has satisfactorily completed (C or better) the majority of work in a course but for personal reasons beyond the student’s control, such as sickness, has not been able to complete the course during the regular semester. Negligence or indifference are not acceptable reasons for an “I” grade.”

Student Protections and Services:

COVID-19 Essentials: Because of COVID-19, University has put in place some mandatory procedures to adhere to. All student are encouraged to observe these rules to ensure a safe environment for all of us for a successful fall semester. I request all of you to do the following:

- 1) Wear mask during class,
- 2) Maintain social distancing in class,
- 3) Use designated doors for entering and exiting,
- 4) Try to sit at the same place in class (for tracing),
- 5) Check updates about COVID-19 on the website listed below on a regular basis.

<https://sites.google.com/alaska.edu/coronavirus/uaf/uaf-students?authuser=0>

Further, students are expected to adhere to the university’s policies, practices, and mandates and are subject to disciplinary actions if they do not comply.

Protection: Every qualified student is welcome in my classroom. Students at this university are protected against sexual harassment and discrimination (Title IX), and minors have additional protections. As required, if I notice or am informed of certain types of misconduct, then I am required to report it to the appropriate authorities. For more information on your rights as a student and the resources available to you to resolve problems, please go the following site: www.uaf.edu/handboo

UA is an AA/EO employer and educational institution and prohibits illegal discrimination against any individual: alaska.edu/nondiscrimination.

Services: As needed, I am happy to work with you, disability services, veterans' services, rural student services, etc to find reasonable accommodations.

Effective communication: Students who have difficulties with oral presentations and/or writing are strongly encouraged to get help from the UAF Department of Communication’s Speaking Center (907-474-5470, speak@uaf.edu) and the UAF English’s Department’s Writing Center (

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907-474-5314, Gruening 8th floor), and/or CTC's Learning Center (604 Barnette st, 907-455-2860).

General Remarks

"Physics is just the refinement of everyday thinking," A. Einstein

Physics is the subject that requires you to think and ponder. Physics is not mathematics, but it does require mathematics to make it useful. In order for you to succeed in this course you may pay heed to the following suggestions.

1. Read the chapter before it is discussed in class so that you know the material and know what questions to ask for clarification.
2. Start your homework on day one so that you have ample time to think about the questions and get the help you need.
3. Think the problems through and follow the logical sequence to get the result.
4. Do not hesitate to ask for help. We wish all of you to excel and we are here to help.

Tentative Schedule

Lecture, Reading, Quizz and Exam

<u>Dates</u>	<u>Topics</u>	<u>Reading Assignment</u>
Jan. 10	syllabus, scope	
12	temperature	Ch 18: sections 1-3
14	heat and energy	Ch. 18: sections 4-6
17	AK Civil Rights Day (no classes)	
19	ideal gases	Ch 19: sections 1-4
21	first law, calorimetry	Ch 19: sections 5-8
24	pressure, temperature	Ch 20: sections 1-3
	Quiz#1	
26	thermal interaction	Ch 20: sections 4-6
28	second law of thermodynamics	Ch. 21: sections 1-2
31	heat engine	Ch 21: sections 3-4

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	Quiz#2	
Feb. 2	carnot engine	Ch 21: sections 5-6
4	electric charge	Ch 22: sections 1-3
7	Coulomb's law	Ch 22: sections 4-5
	Quiz#3	
9	electric field	Ch 23: sections 1-2
11	electric field calculation	Ch 23: sections 3-5
14	charges in electric field	Ch 23: sections 6-7
	Quiz#4	
16	electric flux, Gauss's law	Ch 24: sections 1-3
18	applications of Gauss's law	Ch 24: sections 4-6
21	Midterm	Ch (18-24)
23	electric potential	Ch 25: sections 1-3
25	potential of charge distributions	Ch 25: sections 4-5
28	potential energy	Ch 25: sections 6-7
	Quiz#5	
Mar. 2	electric field and potential	Ch 26: sections 1-4
4	capacitors, electrical energy	Ch 26: sections 5-6
7	Spring Break (no classes)	
9	Spring Break (no classes)	
11	Spring Break (no classes)	
14	dielectrics	Ch 26: sections 6-7
	Quiz#6	
16	current and resistance	Ch 27: sections 1-3
18	Ohm's law	Ch 27: sections 4-5
21	electric circuits, Kirchhoff's rules	Ch 28: sections 1-2
	Quiz#7	
23	basic dc circuits	Ch 28: sections 3-4
25	basic circuits, power	Ch 28: sections 5-7
28	electric power, RC circuits	Ch 28: sections 8-9
	Quiz#8	
30	magnetism, magnetic field	Ch 29: sections
Apr. 1	Ampere's law	Ch 29: sections 4-6

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4	electric force and torque Quiz#9	Ch 29: sections 7-10
6	em induction	Ch 30: sections 1-2
8	Lenz's law	Ch 30: sections 3-4
11	Faraday's law Quiz#10	Ch 30: sections 5-7
13	induced current, inductors	Ch 30: sections 8-10
15	em waves	Ch 31: sections 1-3
18	Maxwell's equations Quiz#11	Ch 31: sections 4-5
20	properties of em waves	Ch 31: sections 6-7
22	AC circuits	Ch 32: sections 1-3
25	RLC circuits Quiz#12	Ch 32: sections 4-6
28	Final Examination (chapters 18-32), Thursday, 10:15-12:15, REIC 201	

Laboratory Schedule REIC 257

Weekly schedule of the lab will be posted on the *Canvas*.