

COLLEGE OF DUPAGE

Physics 1100-002: Physics

Spring 2024

Instructor: Dr. David R. Fazzini *Office:* BIC-3E04B

Office Hours: Mon.: 10:20 AM – 11:50 AM & 4:00 PM – 4:30 PM
Tues.: 1:00 PM – 2:00 PM
Wed.: 10:20 AM – 11:50 AM & 1:00 PM – 2:00 PM
Thur.: 1:00 PM – 2:00 PM
Fri.: 9:00 AM – 9:50 AM & 10:00 AM – 10:50 AM
(Additional times available by appointment.)

NOTE: During some of my office hours, I may be found in the Physics Lab Preparation Room (BIC-3E06) or in one of the adjoining labs (BIC-3E03, -3E05, or 3E07).

Phone: 630-942-3349 *E-mail:* fazzinid@cod.edu
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Course Description:

Conceptual study of laws of motion, forces, energy and momentum, properties and states of matter, heat and thermodynamics, wave motion, sound, light, electricity and magnetism, and atomic and nuclear physics.

Semester Credit Hours: 4 (Weekly: 3 lecture hours + 3 lab hours)

IAI Course Code: P1-900L (for general education)

Prerequisite: MATH 0465 Preparatory Mathematics for General Education with a grade of "C" or better, or equivalent or MATH 0481 Foundations for College Mathematics I with a grade of "C" or better, or equivalent or a qualifying score on the mathematics placement test or a qualifying ACT math score.

Text (req.): Conceptual Physics, 12th ed. by P. G. Hewitt (11th or 10th ed. acceptable)
Material: Chapters 1-34

Lab Manual: N/A (You will be given handouts or links to access the lab activities.)

Keypad: iClicker (Provided by instructor.)

Supplement (optional): Practicing Physics by P. G. Hewitt

Meetings: *Lecture:* BIC-3535 *Lec. Time:* Mon. & Wed.: 9:00 AM – 10:15 AM
 Lab: BIC-3F03 *Lab Time:* Tues.: 9:00 AM – 11:50 AM

General Course Objectives:

Upon successful completion of this course you should be able to do the following:

1. Use observations to formulate hypotheses
2. Demonstrate a functional understanding of physical phenomena and their relationships to daily living
3. Describe the relationships among different units of measure
4. Interpret and explain the relationships among an object's position, displacement, velocity, and acceleration
5. Identify and distinguish different types of forces and identify the reaction force to any action force
6. Describe and calculate the effect of external forces on an object's motion
7. Create and label simple free-body diagrams
8. Identify and calculate the different forms of energy (potential, kinetic, and mechanical) and describe how energy is converted from one form to another
9. Deduce the outcome of collisions of two particles
10. Interpret and describe the relationships among an object's angular position, displacement, velocity, and acceleration
11. Describe and calculate the effect of external torques on an object's rotation
12. Determine the stability of an object using the relationship between center of gravity and support base
13. Classify matter and differentiate among elements, compounds, atoms, and molecules
14. Identify the constituents of an atom and how they are organized
15. Differentiate among density, mass, volume, and weight
16. Calculate stretch or compression of an elastic body using Hooke's law
17. Determine buoyancy using Archimedes' principle
18. Identify the differences among heat, temperature, and internal energy
19. Explain how matter behaves when it absorbs or releases thermal energy
20. Apply the relationship among heat, mass, and change in temperature
21. Explain the differences among conduction, convection, and radiation, and identify thermal conductors and insulators
22. Identify the direction of heat
23. Recognize that energy is conserved and that energy goes from more useful to less useful forms
24. Distinguish between transverse and longitudinal waves and provide examples of each
25. Describe the relationships among amplitude, frequency, period, wavelength, and wave speed of a wave
26. Calculate positions of maximum destructive and constructive interference for waves

27. Explain how sound waves travel and describe Doppler shifts
 28. Identify, construct, and analyze simple electric circuits (series and parallel circuits)
 29. Describe the flow of electricity in terms of voltage, current, and charge and demonstrate mathematical understanding of the relationship among amperes, volts, and coulombs
 30. Explain what happens when a magnet moves through a wire coil (and vice versa)
 31. Explain how electromagnets and transformers work
 32. Describe the relationship between the color of a glowing object and its temperature
 33. Compare color mixing of light and color mixing of paints
 34. Describe image characteristics produced by plane, concave, and convex mirrors
 35. Describe image characteristics produced by plane, concave, and convex lenses
 36. Explain the phenomena of reflection and refraction
 37. Identify components of the electromagnetic spectrum
 38. Differentiate incandescence, fluorescence, and phosphorescence in light emission
 39. Explain why atoms are radioactive
 40. Describe different types of radiation and their effects
 41. Describe nuclear fission and fusion processes and their importance in society
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Course Logistics:

GENERAL COURSE INFORMATION can be found through the class webpage:

<https://cod.edu/faculty/websites/fazzinid/physics-1100.aspx>

and the Blackboard website:

<https://bb.cod.edu/webapps/login/>

Check the class webpage and login to **Blackboard** regularly for general announcements and assignment updates. These sites will provide important announcements and course updates such as reading/online homework assignments and laboratory information. The class webpage will be updated on a regular basis and **Blackboard** will be used for blanket emails and grade dissemination.

READING assignments will be announced in class and posted on the class webpage. It is assumed that you have read the assigned material by the due date (see QUIZZES). Check the class webpage regularly for assignment updates.

HOMEWORK assignments will be provided online using the *MyOpenMath* homework system found at the following URL below:

<https://www.myopenmath.com/>

You will need to subscribe to *MyOpenMath* at a nominal cost. You will need register using the following course ID: **217045**. You will also need the the following (case sensitive) access key: **1100Sp24FD**. All of the homework for the entire term has been generated. Check the class webpage and the *MyOpenMath* calendar regularly for assignment updates. The homework will consist of two types: *Homework Questions* and *Homework Exercises & Problems*.

The *Homework Questions* consist of 10 or so multiple-choice questions and are based upon the reading and discussions from the assigned chapter(s). These tend to be conceptual in nature, but may also require a simple calculation. These *Homework Questions* must be submitted by **8:30 AM** on the due date unless otherwise announced. Once the final cut-off time has elapsed, you will not be able to submit answers or make any changes for credit. (In addition to the *Homework Questions*, short in-class exercises are used to monitor conceptual understanding. [See iCLICKERS.] These can typically be answered by keeping up with the reading assignments and class discussions.)

The *Homework Exercises and Problems* assignments typically consist of several computational exercises and are also due at **8:30 AM** of the date shown. In general, these assignments involve a numerical answer and may be printed for off-line completion if you desire. You may return to the computer to enter your answers and then submit. Only the electronic submissions will be accepted (prior to the cut-off time) for credit.

Be aware that it is very important that you make an honest attempt to work through the questions, exercises, calculations and problems since doing the homework is a primary technique for learning the material. It is also very important that you be able to understand the solutions conceptually rather than just memorizing formulas since the exam questions and problems generally require you to demonstrate application of the concepts being assessed. Be sure that you can answer any assigned question or solve any assigned problem since they may appear on an exam. It is your responsibility to seek assistance from your instructor and/or other resources if you are having difficulties.

QUIZZES consisting a few multiple-choice, matching, or short response questions based upon the chapter reading assignment due that day are administered with warning or without warning prior to the start of each chapter of the text—almost every class. (You must be in class for the quizzes at the time they are administered. There are no “make-ups.” However, there will be a few extra quizzes that can replace a missed quiz.) These are primarily designed to make sure that students keep up with the assigned reading and thus have some familiarity with the topics that are about to be discussed.

iCLICKERS will be provided to each student by the instructor. The system will allow you to further interact with the instructor during the lecture. You will be able to respond to questions and give feedback as the course progresses. The questions typically consist of surveys, conceptual questions or short calculations and are designed to uncover some of the common pitfalls and surface possible misconceptions and that confuse many

students. Students are encouraged to participate in small group discussions with classmates while answering these questions. Responses are recorded and scored. The scoring is used as a measure of class attendance and participation and may be used for as part of the final grade determination particularly in borderline situations.

EXAMS will consist of two “one-hour” exams and a “2-hour” final exam. The one-hour exams and the first hour of the final exam typically consist of 30-40 multiple choice questions and 5-8 problems. The second hour of the final exam is comprehensive and typically has 70-80 multiple choice questions. The questions and problems are derived from homework sets, sample problems from the text and examples worked in class or the laboratory. All exams are closed book and closed note. However, you will be provided with a sheet of “possibly useful information” that contains formulas, constants, etc.

Tentative Exam schedule:

Exam I:	9:00 AM-9:50 AM, Monday, Mar. 4 th	Chapters 1-10
Exam II:	9:00 AM-9:50 AM, Wednesday, Apr. 10 th	Chapters 11-21
Final Exam:	9:00 AM-10:50 AM, Wednesday, May 15 th	Chapters 1-34

LABORATORY sessions meet once per week and are required for this course. (See GRADING.) The laboratory section is designed to provide you with hands-on experiences related to the topics that are discussed in the classroom. During the lab, you will make predictions, record observations, draw inferences, and answer questions in the “handouts” that you will print from the class webpage **prior** to entering the lab. Throughout the session and upon successful completion of the lab, your instructor will “stamp” your work and record your attendance. Laboratory assignments are to be completed over the week and submitted at the beginning (9:00 AM) of the next laboratory session. Only officially stamped work will be accepted for credit. Each lab is graded in two parts: 1) completion of the required measurements and “in-lab” questions and 2) completion of the laboratory homework. Each piece is worth 50% of the total score for that lab. There is a 10% penalty for any lab that is submitted after 9:00 AM of the due date and an additional 10% for every 24 hours that a lab is noted submitted. After one week, no labs are accepted for credit.

PRE-LABS for each laboratory session will also be made available from the class webpage for you to print. Each pre-lab consists of a few short questions based on the reading of that week’s lab. These are to be completed **prior** to entering the lab for that session. Pre-labs are due at the beginning (9:00 AM) of the lab session. Each pre-lab submitted by 9:00 AM for that session is worth up to 10% bonus credit of the standard lab grade. The pre-labs **must** be submitted by 9:00 AM in order to receive the bonus. Pre-labs submitted after 9:00 AM are recorded, but do not receive the bonus. Pre-labs not submitted before the end of the session incur a 10% penalty on that week’s lab grade.

PARTICIPATION in the course can have a reflection in the overall final grade. Items such as attendance, attitude, sincerity, changes in performance, keypad scores, iClickers, etc. will be considered in borderline situations.

GRADING is tentatively based on the following breakdown:

Homework:	150 points	A: > 900 points
Quizzes:	150 points	B: > 800 points
Laboratory*:	130 points	C: > 700 points
2 Hourly Exams:	320 points (160 pts. each)	D: > 600 points
Final Exam:	250 points	F: < 600 points

Depending on other factors involved with the course, it is possible for the grade cut-offs to be lowered by up to 50 pts., but do not count on it.

* Laboratory attendance is a required part of the course. Your final grade will drop one full letter for every two sessions that are missed regardless of exam/homework/quiz scores. As there are no “make-ups,” you are strongly advised to perform AND submit all lab activities.

ATTENDANCE/TARDINESS:

In general, formal attendance is recorded by means of “iClickers,” submitted quizzes, and officially stamped laboratory work. Students who have missed 5 or more classes or labs AND are not passing with a grade of “C” or better by Friday, March 15th, 2024 will be considered in “non- pursuit” and may be dropped from the course by the instructor. Students who do not “click in” during the class due to tardiness or any other reason will not necessarily have their attendance recorded.

ACCOMMODATIONS: The College of DuPage is committed to the equitable access of educational opportunities for students with disabilities in accordance with The Americans with Disabilities Act, As Amended and Section 504 of the Rehabilitation Act of 1973. Any student who feels they may need an accommodation on the basis of an illness, injury, medical condition, or disability should contact the Center for Access and Accommodations to determine eligibility for accommodations and to obtain an official Letter of Accommodation. The Center for Access and Accommodations can be reached via email at

access@cod.edu.

Students may also initiate a request for services by going to www.cod.edu/access and clicking on the green box labeled “complete form to request accommodations.” If you are already registered with the Center for Access and Accommodations, please email me your Letter of Accommodation as soon as possible. Please DO NOT send any private health documentation or doctor’s notes to me.

LATE MATERIAL & MAKE-UPS:

All quizzes and exams must be completed on the scheduled date at the time they are scheduled. There are no make-ups for any reason except jury service, medical quarantine, or call to active military duty. If absent for either “one-hour” exam, then the % score of the final exam will be applied to one (and only one) missed exam. All online homework must be submitted by the cut-off time and all laboratory homework must be submitted at the assigned time to receive maximum credit. Any lab not submitted prior to the cut-off time receives a 10% penalty. After that, the penalty is an additional 10% for every 24 hours past the original due date and time. Two “homework late passes” and two “late lab passes” will be allowed for the semester.

RETURN POLICY:

In general, every effort will be made to return work/provide feedback in a timely fashion usually within one week after submission.

WITHDRAWAL POLICY:

The last day to withdraw from this course without appeal is Saturday, April 13th, 2024. After that date, students may file a *Petition for Late Withdrawal* through the Registration Office. A *Petition for Late Withdrawal* will be granted for extenuating circumstances only, including student illness, death in the immediate family, family emergencies, call to active duty, or other appropriate extenuating circumstances. The student will be required to provide appropriate documentation for all requests for late withdrawal. Students are strongly encouraged to speak to their instructor prior to withdrawing from this class.

As stated earlier, students who have missed 4 or more classes or labs AND are not passing with a grade of “C” or better by Friday, March 15th, 2024 will be considered in “non-pursuit” and risk being administratively dropped from the course. (No refunds!)

INCOMPLETE POLICY:

Under extraordinary circumstances (such as an extended medical emergency or family tragedy) a student currently earning “C” or better may not be able to complete all of the course requirements. In such instances, the student may petition the instructor for an “incomplete” grade. Only if the instructor deems the request as warranted will a contract agreement be made between the student and instructor as to how the course will be completed. After both the student and the instructor sign the contract, the student will receive a grade of “I”. Note: The course must be completed with the same instructor and within one calendar year of the end of the term for which the student was enrolled. If the student does not complete the requirements for the course as prescribed in the agreement, the “I” grade will automatically revert to a grade of “F.” It is advised that the students be fully aware of the consequences of receiving an incomplete grade and understand the terms described in the COD Catalog and can be accessed at

<https://catalog.cod.edu/academic-policies-procedures/>

CONDUCT & DISRUPTIONS:

The proprietor of any cellular device that is heard to go off in class or the laboratory ensures him/herself a "0" on the next quiz. Disruption during an exam will result in a 5-point deduction off that exam score (10 points during the final exam).

It is expected that you are aware of and follow the guidelines for conduct as described in the COD Catalog: *Student Rights and Responsibilities*. In particular, *Student Code of Conduct (Board Policy 20-35)*. Individuals that exhibit disruptive behaviors that interfere with the lectures and/or laboratory sessions will be removed from the class so that those individuals who wish to learn physics can do so. Those individuals removed must then conference with either the Dean or an Associate Dean in Natural & Applied Sciences Division. Those individuals may then rejoin the class pending the outcome of the conference.

Anyone caught cheating or plagiarizing will receive an automatic failure for the course. You will not be allowed to drop the class if you are found in violation of this section. It is expected that you are aware of and follow the guidelines for conduct as described in the COD Catalog, pp. 163-164: *Students Code of Academic Conduct (Board Policy 20-41)* and that you are aware of the definitions of the terms described therein. Also, the college will not tolerate discrimination or harassment. It is also expected that you are aware of and follow the guidelines for conduct as described in the COD Catalog, page 167: *Prohibition of Discrimination, Harassment and Sexual Harassment (Board Policies 15-10 and 15-11)*. The policies described in this section can be accessed at

<https://catalog.cod.edu/student-services-general-student-information/>

CALCULATORS, LAPTOPS & CELL PHONES:

Students may use their own calculator for all activities. TI-30 non-graphing calculators are available for check-out from the Math Assistance Center and/or the Library although students should not depend on them being available during the exam. Students are responsible for bringing a calculator to the exam and knowing how to use it. During exams, there is no sharing of calculators and the cover must be removed.

No CELL PHONE CALCULATORS may be used during exams. Students may use laptops or tablets to take notes during lecture only under the following conditions: 1) the screen must be displayed upon request and 2) you show me that day's notes at the conclusion of the class. If these conditions cannot be met, then you may not use the device in class.

The proprietor of any cellular device that is heard to go off in class or the laboratory ensures themselves a "0" on the next quiz. Disruption during an exam will result in a 5-point deduction of that exam score (10 point in during the final exam).

COMMUNICATION:

You should use email or phone as a method to communication with me if my office hours conflict with your schedule. You are strongly encouraged to ask questions about the syllabus during class time and office hours. For more in-depth discussions (such as guidance on assignments) it is possible to set up a one-on-one zoom meeting if a face-to-face meeting is not possible. Such conversations should take place in person or over the phone rather than through email. This allows us to communicate more effectively and fosters a more collegial learning atmosphere.

RELIGIOUS OBSERVANCE:

The College will reasonably accommodate the religious observances of individual students with respect to class attendance, and the scheduling of examinations and class requirements. The student should notify the instructor well in advance of any anticipated absence or a pending conflict between a scheduled class and the religious observance.

TENTATIVE PHYSICS 1100 LECTURE SCHEDULE for Spring 2024

Week	Dates	Chapter(s)	Topic(s)
1	Jan. 22 & 24	Introduction	(Syllabus)
		1	The Nature of Science
2	Jan. 29 & 31	2	Inertia & Newton's 1 st Law of Motion
		3	Describing Linear Motion
3	Feb. 5 & 7	4	Newton's 2 nd Law of Motion
		5	Interactions & Newton's 3 rd Law of Motion
4	Feb. 12 & 14	6	Impulse, Momentum & Conservation
		7	Work & Energy
5	Feb. 19 & 21	8	Conservation of Energy
		9	Torque & Rotational Motion
6	Feb. 26 & 28	10	Gravity & Projectile/Satellite Motion
		11 & 12	Atomic Nature of Matter & Solids
7	Mar. 4 & 6	Exam I	Chapters 1-10
		13	Pressure & Archimedes' Principle
8	Mar. 11 & 13	14	Liquids, Gases & Plasmas
		15	Temperature & Heat
9	Mar. 18 & 20	16 & 17	Heat Transfer & Phase Changes
		18	Laws of Thermodynamics
10	Mar. 25 & 27	NO CLASSES	SPRING BREAK
11	Apr. 1 & 3	19	Vibrations & Waves
		20 & 21	Sound & Music
12	Apr. 8 & 10	22 & 23	Electrostatics & Electric Circuits
		Exam II	Chapters 11-21
13	Apr. 15 & 17	24	Magnetism
		25	Magnetic Induction
14	Apr. 22 & 24	28	Reflection & Refraction
		29	Light Waves
15	Apr. 29 & May 1	26 & 26	Light & Color Properties
		30 & 31	Light Emission & Light Quanta
16	May 6 & 8	32	The Atom
		33 & 34	Radioactivity & Nuclear Processes
17*	May 15	Final Exam	All covered material: Chapters 1-34

* Denotes shortened week due to final exams.

There are NO CLASSES during Week 10 due to Spring Break

NOTE: Not every topic in the each assigned chapter may be discussed in class. However, you are responsible for every topic in each assigned chapter unless otherwise stated. If you are having difficulty with a topic that is or is not discussed in class, it is your responsibility to seek out the instructor and/or other resources to ensure understanding of that topic.

TENTATIVE PHYSICS 1100 LABORATORY SCHEDULE for Spring 2024

Week	Tuesday Dates	Investigation	Topic(s)
1	Jan. 23 rd	1	Variables, Measurements & Scientific Methodology
2	Jan. 30 th	2	Introduction to Motion
3	Feb. 6 th	3	Introduction to Forces & Newton's 2 nd Law of Motion
4	Feb. 14 th	4	Newton's 3 rd Law of Motion, Collisions & Conservation of Momentum
5	Feb. 20 th	6	Torques, Lever Arms & Balance
6	Feb. 27 th	Special	Lecture & Demonstrations
7	Mar. 5 th	7	Density & Archimedes' Principle
8	Mar. 12 th	8	Temperature vs. Heat
9	Mar. 19 th	9	Specific Heat Capacity & Latent Heat
10	Mar. 26 th	NO LAB	SPRING BREAK
11	Apr. 2 nd	10	Standing Waves, Resonance & the Speed of Sound
12	Apr. 9 th	Special	Lecture & Demonstrations
13	Apr. 16 th	11	Electric Circuits & Ohm's Law
14	Apr. 23 rd	12	Magnetism & Electromagnetic Induction
15	Apr. 30 th	13	Optics
16	May 7 th	14	Atomic & Nuclear Physics

COURSE EXPECTATIONS

Physics 1100

What Dr. Fazzini Expects from You:

- You will have read the syllabus.
- You will be punctual to class.
- You do not make or receive telephone calls or text messages during class or lab sessions.
- You demonstrate respect for what I and your fellow students have to say.
- You will come to class prepared (notebook, pencils, calculator, etc.)
- You will come to class ready to ask and answer questions of substance on the day's topic(s).
- You will concentrate exclusively on this course during the class hours of this course.
- You will “check your entitlement at the door” and take responsibility for your own learning.

What You Can Expect from Dr. Fazzini:

- I will be punctual to class.
 - I will give each of you a fair share of my attention.
 - I will work to make the class interesting and relevant.
 - I will make myself available as a helpful resource outside of class.
 - I will work to help you learn the material and perform at your best.
 - I will be the sole arbiter of partial credit.
 - I will grade the QUALITY of your work rather than the amount of time and effort you spent on it. (In other words, you will be assessed on your demonstrated performance rather than on anecdotal testimony.)
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Disclaimer:

To the best of the instructor's knowledge, the information in this syllabus was correct and complete at the start of the semester. However, the instructor reserves the right, acting within the policies and procedures of the College of DuPage, to make changes in course content, instructional techniques or grading policy during the term. (Any changes would always be in favor of the student body as a whole.) It is assumed that you have read this course syllabus. Your continued enrollment in this course means that you accept the terms and conditions outlined in this syllabus.

Detailed Topical Outline:

Nature of Science

- Units and scientific measurement
- Scientific methodology
- Science and technology

Mechanics

- Linear motion (position, velocity, and acceleration)
- Forces and Newton's laws of motion
- Momentum and impulse
- Work and energy
- Conservation laws
- Rotational motion, torque, and angular momentum
- Gravity, projectile motion, and satellite motion

Properties of Matter

- Atomic nature of matter
- Structure and classification of matter
- States of matter
- Density and elasticity
- Pressure
- Archimedes' principle and buoyancy
- Pascal's principle
- Boyle's law and Bernoulli's principle

Heat and Thermodynamics

- Temperature, heat, and internal energy
- Specific heat capacity and thermal expansion
- Heat transfer (conduction, convection, and radiation)
- Phase changes and latent heats
- First law of thermodynamics
- Heat engines and efficiency
- Entropy and the second law of thermodynamics

Vibrations and Waves

- Wave description and motion
- Transverse and longitudinal waves
- Wave interference and standing waves
- Sound, beats, and the Doppler effect
- Forced vibrations and resonance

Electricity and Magnetism

- Electric charges, forces, and fields
- Coulomb's law
- Charge conservation

Electrical potential and electrical potential energy
Electric circuits and Ohm's law
Magnetic poles, forces, and fields
Electromagnets, electromagnetic induction, and transformers

Properties of Light

Electromagnetic spectrum
Color and color mixing
Reflection and refraction
Mirrors and lenses
Interference, diffraction, and polarization
Incandescence, fluorescence, and phosphorescence
Light quanta (photons)

Atomic and Nuclear Physics

Atomic spectra and the Bohr model
Atomic nucleus, isotopes, radioactivity, and half-life
Nuclear fission, fusion, and mass-energy equivalence