

# PHYS 100

## (General Physics Fall 2021/SPRING 2022)

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**Office Hours:** Monday 11 am - 12pm, 2pm - 4pm; Tuesday 1pm - 2pm; Wednesday 11am - 12pm, 2pm - 4pm; Thursday 12pm - 2pm; Friday 11 am - 12pm, 2pm - 4pm: and by appointment.

**Textbooks:** **Conceptual Physics** by Paul G Hewitt provided by the Indiana Academy.

**College Physics (2012)** available online  
[College Physics - OpenStax](#)

<https://openstax.org/books/college-physics/pages/preface>

**Internet Resources:** <https://www.nsf.gov/news/classroom/physics.jsp>

### **Indiana Academy Mask Policy**

The Indiana Academy will follow [Ball State University's mask policy](#) (see Section IV). Based on current CDC guidance recommending the wearing of face masks for all people—regardless of vaccination status—in public indoor settings in communities where the rate of coronavirus transmission is high or substantial, all employees, students, and campus visitors are required to wear a mask while inside any University building. This requirement is effective on August 9, 2021. Fully vaccinated people are not required to wear masks outdoors.

Individuals who are not fully vaccinated for COVID-19 are required to wear face masks while inside campus buildings and outside when physical distancing cannot be maintained.

If a student declines to wear a face mask as required, the student will be referred to the Director of Academic Affairs or the Director of Residential Affairs. If the situation occurs in a classroom or other academic setting, it is considered a classroom management issue, and the teacher will remind the student of the requirement and give the student a chance to comply with it prior to referring the matter to the Director of Academic Affairs or the Director of Residential Affairs. Wearing masks is crucial to preventing the spread of COVID-19 to others.

### **Indiana Academy Diversity Statement**

The Indiana Academy for Science, Mathematics, and Humanities is committed to being an inclusive educational community that values diversity in policy and practice. We aim to foster an educational environment where students, faculty, and staff exchange ideas freely, engage in critical thinking, and reexamine their personal perspectives. To create an environment where this respectful and productive dialogue is possible, we do not allow discrimination on the basis of race, ethnicity, sex, geographic origin, gender, gender identity, sexual orientation, disability, religion, age, or nationality. The affirmation, appreciation, and inclusion of multiple cultures ensures that all students, faculty, staff, and the wider Indiana Academy community will be able to thrive in our multicultural academic and residential environment.

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### Philosophy:

*“Most people study physics to satisfy some school requirement. A small number study physics to learn the tricks of Nature so they may find out how to make things bigger or smaller or faster or stronger or more sensitive. But a few, a very few, study physics because they wonder – not how things work, but why they work. They wonder what is at the bottom of things – the very bottom, if there is a bottom”*

-- Louis Carol Epstein

*“Those who are not shocked when they first come across quantum theory cannot possibly have understood it.”*

— Niels Bohr

Why do we study physics?

We study physics in order to understand how things around us function, for instance, why does cold water boil faster than warm water? why does ice float on water? why does light go round corners? Studying physics also helps us to develop a critical and analytical mind; skills necessary for problem-solving in real-life situations.

### Laptop Policy

1. No game-playing, movie-watching, e-mail, or IM'ing, browsing allowed in class.
2. Laptops should be brought to class during laboratory sessions. Laptops can be used for classwork such as taking notes and reading class notes. For an undesired use of a laptop, you will be assigned an unexcused absence for that day.

### Grades:

Your grades will be based on the following:	Fall	Spring
Tests (incl. Final exam)	60%	60%
Homework	15%	15%
Labs	25%	25%

Each test will be comprised of both multiple-choice and free-response questions that will examine both learned concepts and problem-solving skills.

Homework, interspersed with quizzes, will be assigned throughout the course. Material covered by these assignments/quizzes will be topic specific, whereas test problems may contain material covered by several chapters at once. Homework is due at the beginning of the class on the due date. Late homework and labs \*may\* be accepted, but will be recorded as a D\*. (Still better than a zero!)

**Test scores are graded on a preset scale.** Exams are designed to focus on critical thinking and understanding, and therefore tend to be considerably more challenging than a typical pure-content driven test. The following (approximate) grading scale will be used in the course:

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85% and above	<b>A</b>
75 - 84 %	<b>B</b>
65 - 74%	<b>C</b>
55 - 64 %	<b>D</b>

### **Attendance and Academic Integrity:**

You have made a commitment toward academic achievement by attending the Academy – both attendance and integrity are essential components to that success.

Class attendance is **mandatory**. An unexcused absence on the day of a lab or test will result in an **automatic zero** for that lab or test. *Missing homework, quizzes and/or tests during an excused absence must be made up as soon as possible. It is the student's responsibility to make arrangements with the teacher.*

Students are expected to be in their chairs at the beginning of the period. There is a small grace period of 2 minutes to account for the occasion when a previous class runs over, or other 'life-happens' incident. After this grace period, a 'tardy' will be entered for attendance for students who are late for up to 7 minutes.

It is also important that your brain be here as well as your body. Students who fall asleep in class will receive either a 'tardy' or an 'absent' mark from the instructor, depending on circumstances. Make sure you avoid this by getting enough sleep the night before!

In addition, it is imperative to your continued success that you exhibit academic integrity at all times. This entails:

- 1) never submitting another person's work as your own.
- 2) never engage in "dry-labing." (Artificially manufacturing lab data and submitting it as part of a lab report)
- 3) never cheating on quizzes and/or tests.
- 4) following all ethical standards as described in your student handbook (see "Academic Dishonesty")

It is very important to note that if you feel you have been unfairly accused of academy dishonesty, you have the right to bring your case before the Academic Integrity Review board (as per the student handbook).

### **Student Accommodations**

Students possessing an educational 504 or IEP should contact the instructor as soon as possible to arrange for any accommodations that may be needed. Likewise, if you feel that you could benefit from an educational 504 or IEP, feel free to contact the instructor to this regard.

### **Homework Assignment Requirements**

1. Label the first page with your name, the class, and the specific assignment (e.g., "Homework #1", or "Kinematics"). **Staple** your pages together (no paperclips).
2. Handwritten assignments must be done in pencil, or blue or black ink. If the problem is prone to multiple mistakes (i.e., the typical physics problem), it is strongly suggested to use pencil and **completely** erase before adding corrections.
3. Writing must be clear and legible so that reader does not have to work to decipher what is written. Give adequate space to clearly show your work. Leave white spaces between problems to clearly separate them.
4. Lay out your work in a clear and organized fashion that can be easily followed. Break your work into logical steps.
5. For problems that require mathematical manipulation, make sure to include appropriate units in both your work and your answer.
6. Homework will be turned in at the beginning of the class on its due-date. Homework that is turned in late will be accepted but will receive a score of D\* (better than a \*zero\*, certainly!).

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### Laboratory Report Requirements

1. Lab reports may be typed or handwritten, although handwritten reports must be legible!
2. If a particular method is not dictated for a lab, graphs may be done by hand or by computer. Both methods have advantages and disadvantages.... Don't immediately assume that the computer-method is more accurate! (It often isn't!)
3. Reports should include, at least, the following:
  - a. A brief statement on the purpose of the lab: This is meant to be a 'higher purpose,' not a basic synopsis of the procedure. Bad example: "This lab was performed to measure the acceleration due to gravity." Good example: "This lab was performed to instill an understanding of basic lab methods, as well as to practice with mathematical uncertainty and deviation."
  - b. A list of equipment used in the lab: If you do not know the name of a device, ask the instructor.
  - c. A detailed procedure that you could follow five years from now *and get approximately the same results*. If you can follow it five years from now, someone who hasn't performed the experiment already (most readers) could follow it tomorrow.
  - d. Your data (if there is not much data), or a sample set of your data (if there is too much to conveniently add into the body of your report) should be included.
  - e. Your calculations (or a sample calculation of your sample data) should be included to show how you used your data.
  - f. Your results should be clear, concise and listed separately. Uncertainty and deviation must be included if appropriate.
  - g. A discussion of what your results signify. e.g., "Although our results show a reasonable answer, it was much lower than expected..." etc., etc., etc.
  - h. Error Analysis: This is perhaps the most important part of the lab report. Carefully list what errors occurred in the lab session, both known and unknown. Unknown errors include those that *most likely occurred* to explain the deviated results you experienced. Explain how a person following your procedure (see above) could improve upon your method to achieve better results.
4. **Failure to turn in three (3) laboratory reports will result in an automatic D\* in the class, regardless of lecture grade.**
5. If a group performs the lab together, I will expect more from the lab write-up. While only one person will be required to write the report, the other members are required to make up for their part by performing the lion's share of calculations and graphing. Group individuals are to take turns writing reports... DO NOT get into the habit of doing the same 'job' each time. The primary authors name is to be on top of the list of students in the group when turning in the report.
6. Make sure that the name(s) are on subsequent pages, and that all pages are **stapled**.

### **THIS IS VERY IMPORTANT!!!**

This is a college-level course available for dual credit with Ball State University. You should take care to maintain proof of your laboratory experience if you wish credit with BSU or if you have plans to transfer this credit to another university.

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### TENTATIVE COURSE OUTLINE

<b>FALL SEMESTER</b>		
<b>Week</b>	<b>TOPIC</b>	<b>LAB</b>
1	Scientific process: Physics as a scientific discipline	Uncertainty
2 & 3	Physical Quantities: units, precision	Unit conversions, significant figures
4	Kinematics: Scalars, vectors, circular motion	Measurement of speed
5	Kinematics: Velocity, speed, acceleration, momentum	Indirect measurement Techniques for distances
6	1 DIM Kinematics: Constant acceleration, motion in a gravitational field. <b>TEST 1</b>	Representation of motion graphically.
7	2 DIM Kinematics: Vector addition	Measurement of acceleration due to gravity
8	2 DIM Kinematics: Projectile Motion	Projectile motion
9	Dynamics: Concept of force, Newton's law of motion	Frictional forces
10	Newton's laws of motion	Newton's laws
11	Application of Newton's laws <b>TEST 2</b>	Coefficient of friction
12	Rotational Dynamics: Centripetal force, angular momentum	Spring-mass systems, centripetal force
13	Gravitation and orbital motion	Work and Energy
14	Work, Energy, and Power: Potential and kinetic energy, conservation of energy	Energy transformations
15	Linear Momentum: types of collisions, conservation of momentum	Collision and conservation of momentum
16	Rotational Motion: Oscillatory motion, simple harmonic motion <b>FINAL EXAMS</b>	Simple pendulum, determination of acceleration due to gravity
17	Classical Mechanics and its limitations.	N/A
18	<b>FINAL EXAMS</b>	N/A
<b>SPRING SEMESTER</b>		
1	Wave Mechanics: Wave properties and propagation, standing waves, resonance	Density of a string, standing waves
2	Sound: beats, Doppler effect	Speed of Sound
3	Electrostatics: Theory and observations, Coulomb's law	Electric fields
4	Electric fields, electric potential, voltage	Electroscope
5	Electricity: electric currents, Ohms law, series and parallels circuit <b>TEST 1</b>	N/A
6	Electric Circuits: Applications	Electric circuits
7	Electromagnetism: concepts and applications	Ohm's law
8	Electromagnetic spectrum and radiation	Series and parallels circuits
9	Light: Refraction and reflection, ray optics	Reflection and refraction of light

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10	Light: Interference, diffraction <b>TEST 2</b>	N/A
11	Heat and Temperature: Ideal gas laws	Spherical mirrors and lenses
12	Laws of thermodynamics and their applications	Double-slit experiment
13	Frame of reference and special relativity	Diffraction and diameter of hair
14	Wave Mechanics and postulates of Quantum Mechanics.	Cooling rate
15	Application of Quantum Mechanics <b>FINAL EXAMS</b>	Index of Refraction
16	Special Topic: General Relativity	N/A

The contents of the course outline are subject to change. Changes will be announced in class.