

Algebra-Based Physics

2025–2026 Academic Year

Instructor Information

Instructor: Jan C. Bierowiec (Mr. B.)

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Office Hours:

- Monday 3:00 – 3:30
- Tuesday 3:00 – 3:30
- Thursday 3:00 – 3:30
- Friday 3:00 – 4:00

Course Description

Physics is the study of the rules that govern the physical universe. In this introductory, algebra-based course, students will investigate these rules by exploring the motion of objects, the forces that cause motion, energy, momentum, waves, electricity, circuits, and other fundamental physical phenomena. Along the way, students will discover how a relatively small set of physical principles can be used to explain an enormous range of events—from a falling object to the motion of planets to the flow of electricity through a circuit.

The course emphasizes conceptual understanding, critical thinking, and scientific reasoning rather than simply memorizing equations. Students will learn how to identify relevant information, represent physical situations with diagrams, graphs, and equations, make predictions, analyze evidence, and use algebra and basic trigonometry to solve real-world physics problems.

Investigations will take a variety of forms, including problem-solving, hands-on laboratory experiments, demonstrations, data collection and analysis, collaborative inquiry, and self-directed research. By the end of the course, students should not only be able to solve physics problems, but also be able to look at the world around them and use physics to explain why it behaves the way it does.

Learning Goals

Students will:

1. Develop scientific inquiry, experimental design, data analysis, and mathematical modeling skills.
2. Analyze **motion and kinematics**, including position, displacement, speed, velocity, acceleration, motion graphs, and projectile motion.
3. Apply **Newton's Laws of Motion** to analyze forces, free-body diagrams, friction, tension, normal forces, weight, and equilibrium.
4. Analyze **work, energy, and power**, including kinetic energy, gravitational potential energy, elastic potential energy, and conservation of mechanical energy.
5. Analyze **linear momentum and impulse**, including collisions and conservation of momentum.
6. Analyze **circular motion and gravitation**, including centripetal force, orbital motion, and Newton's Law of Universal Gravitation.
7. Investigate **electricity and circuits**, including electric charge, electric forces, electric fields, electric potential, current, resistance, voltage, and simple DC circuits.
8. Apply **algebra, geometry, trigonometry, and graphical reasoning** to describe and solve

physical problems.

9. Construct and interpret **graphs, equations, diagrams, and physical models** to explain relationships among physical quantities.
10. Connect physics concepts to **real-world situations, technology, engineering, and everyday experiences**.

Class Policies

1. Be responsible.
2. Be respectful.
3. Communicate.
4. Your work must be your own.

Required Materials

- Calculator
- Pencil (or erasable pen)
- Notebook (all notes must be handwritten)
- Folder or binder for handouts (recommended)

Course Structure

Daily Quizzes: Every class begins with a brief 5-minute quiz reviewing the previous lesson.

Notes: Class slides/class notes will be posted prior to each test for review (not after each class period). If absent, you must obtain notes from a classmate or schedule a meeting with me during office hours.

Investigations: Learning includes problem-solving, hands-on inquiry, laboratory investigations, and research projects.

Grading Breakdown

Tests	40%
Lab Work & Projects	30%
Homework	20%
Daily Quizzes	10%

Late Work Policy

All work is due at the start of the class period for which it is assigned. Missing or incomplete work will be penalized 10% per day unsubmitted. Assignments more than one week late will result in a grade of zero.

Major Topics

- Scientific Inquiry
- Kinematics
- Dynamics
- Circular Motion & Gravitation

- Energy & Work
- Momentum & Impulse
- Electrostatics
- Electrical Circuits

Communication Expectations

Students are responsible for:

- Checking myLS regularly
- Obtaining notes if absent
- Communicating early regarding academic concerns