



Physics Course: Measurements and Motion

An Introductory Course in Fundamental Physics Concepts

Scan the **QR code** or visit our website: <https://nexus-stem.org/> for more information.



Course Overview

This course introduces the essential foundations of physics, focusing on measurement, uncertainty, and the study of simple motion. Students will build problem-solving skills and understand how physical laws describe everyday phenomena.

Syllabus Highlights

- **Measurements and Units**
 - Physical quantities and SI units
 - Accuracy vs. precision
 - Significant figures and rounding
 - Uncertainty and error propagation
 - Types of experimental errors
 - Reporting scientific results
- **Motion Along a Straight Line**
 - Position, displacement
 - Elapsed time and time intervals
 - Average vs. instantaneous velocity
 - Average vs. instantaneous acceleration
 - Motion with constant acceleration
- **Graphical analysis: $\mathbf{x} - t$, $\mathbf{v} - t$, $\mathbf{a} - t$ plots**
- **Free fall and vertical motion**
- **Integrating velocity to get position**
- **Using motion equations for problem solving**
- **Real-world applications: projectiles, falling objects**
- **Integration method**
- **Basic Python Skills for Physics**
 - Python syntax and Jupyter notebooks
 - Variables, loops, and simple plotting
 - Implementing the trapezoid rule for integration
 - Round-off errors and numerical accuracy
 - Writing small programs to solve physics problems

Key Equations

- **Instantaneous Velocity:** $v = \frac{dx}{dt}$
- **Instantaneous Acceleration:** $a = \frac{dv}{dt}$
- **Kinematic Equation 1:** $v = v_0 + at$
- **Kinematic Equation 2:** $x = x_0 + v_0t + \frac{1}{2}at^2$
- **Kinematic Equation 3:** $v^2 = v_0^2 + 2a(x - x_0)$
- **Free Fall:** $y = y_0 + v_0t - \frac{1}{2}gt^2$

References

- Young, H. D., Freedman, R. A., — *University Physics with Modern Physics, Fifth Ed.*, Pearson, 2019
- Matthes, Eric. — *Python crash course: A hands-on, project-based introduction to programming.* no starch press, 2023.

Meet the Instructors

Bradford Chen

education or occupation?

5+ years teaching math and physics

Specialist in classical mechanics.

Kai Jin

Ph.D. in Mechanical Engr., U of I at Urbana-Champaign

Research background: Computational Fluid Dynamics

Passionate about Student Engagement and Learning.

Enrollment Information

Course Fee: \$80 per lecture (2.5 hours)	Duration: 8 Weeks/Lectures	Saturdays or Sundays, in-person class at
Naperville. For inquiries and enrollment, contact: info@nexus-stem.org		