

PHYS1441 — Physics 1.3

Course Description:

This is the first of a three-semester sequence of calculus-based physics course that is the foundation to further studies in engineering and technology. The first semester introduces students to concepts and principles of classical mechanics and thermodynamics. Topics include kinematics, Newton's laws of motion and universal gravitation, work and energy, rotational motion, vibrations, fluids, heat and laws of thermodynamics. Calculus and vector methods are used throughout the course. Computer-based laboratory component of the course illustrates and supplements the lecture material.

Pre- or corequisite: **MAT 1475**

Required Text:

Physics for Scientists and Engineers with Modern Physics, D. C. Giancoli, 4th Edition, Prentice Hall.

Computer-Based College Physics Laboratory Experiments, R. Kezerashvili, Gurami Publishing.

Instructional Objectives (Learning Outcomes):

This course is designed for students to obtain qualitative and quantitative knowledge of basic laws of mechanical and thermal properties of matter. Emphasis is placed on experimental foundation of physics as a natural science. The course helps students to learn qualitative and logical reasoning about physical phenomena. One of the main goals is to develop and improve students' analytical and problem solving skills by discussing applications to specific problems in engineering and technology.

Learning objectives include:

1. To be familiar with scientific method
2. To understand the basic properties of vectors
3. To be able to describe motion in terms of position, velocity and acceleration
4. To be able to analyze motion in terms of motion graphs

5. To understand the use of vectors in describing projectile and circular motion
6. To be able to identify forces acting between objects and draw free-body diagrams
7. To understand and use Newton's laws of motion
8. To understand the connection between forces and motion
9. To differentiate between concepts of work, energy and power
10. To be able to use principles of energy and linear momentum conservations in solving problems involving kinetic and potential energy as well as collisions between objects
11. To be able to describe simple rotational motion in terms of angular displacement, velocity and acceleration
12. To understand the connection between force and torque
13. To have basic knowledge of properties and phenomena in fluids including buoyancy and laminar flows
14. To know the basic properties of motion of a simple harmonic oscillator
15. To be able to use gas laws and understand the basic principles of kinetic theory of gases
16. To understand the concepts of heat and internal energy
17. To be able to use the first law of thermodynamics as applied to heat engines

Assessment:

Students will be evaluated through homework assignments, two midterm and final exams, laboratory reports and oral presentation. The final grade will be based on a weighted average of the grades from the exams and reports as follows:

Two Exams 40%
Final Exam 40%
Lab Grade 20%

Course Outline

Lectures: 4 hours/week

Week 1: Measurement, estimating, Chapter 1

Week 2: Kinematics in one dimension, Chapter 2, 14.1-14.5

Week 3: Vectors, kinematics in two dimensions, Chapter 3

Week 4: Dynamics, Newton's laws of motion., Chapter 4

Week 5: Applications of Newton's laws, gravity, Chapters 5, 6

Week 6: Work and energy, Chapter 7

Week 7: Conservation of energy, Chapter 8

Week 8: Linear momentum and collisions, Chapter 9

Week 9: Rotational motion, Chapters 10, 11

Week 10: Static equilibrium, elasticity, fracture, Chapter 12

Week 11: Fluids, Chapter 13

Week 12: Oscillations, Chapter 14

Week 13: Heat and temperature; kinetic theory of gases, Chapters 17, 18

Week 14: Thermodynamics, Chapters 19, 20

Week 15: Review and final exam

Laboratory work: 3 hours/week

Week 1: Orientation, experimental errors, and data analysis; introduction to Excel and Power Point

Week 2: Instantaneous velocity and uniformly accelerated motion in one dimension

Week 3: Addition of vectors and the force table

Week 4: Acceleration due to gravity; Free Fall

Week 5: Newtons second law

Week 6: Application of Newtons second law: centripetal force

Week 7: Conservation of mechanical energy; the force of gravity

Week 8: Verification of work-energy theorem

Week 9: Conservation of linear momentum

Week 10: Ballistic pendulum

Week 11: Simple harmonic motion

Week 12: The simple pendulum

Week 13: Torsion pendulum and determination of the moment of inertia of an irregular object

Week 14: Boyles law

Week 15: Oral presentation

Academic Integrity Policy Statement

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and at New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion.

College Policy on Absence/Lateness

A student may be absent without penalty for 10% of the number of scheduled class meetings during the semester as follows:

Class Meets	Allowable Absences
1 time/week	2 classes
2 times/week	3 classes
3 times/week	4 classes