



**The College is dedicated to providing you ample opportunity for you to learn, practice, and master the skills and knowledge you need to succeed.**

## DEPARTMENT SYLLABUS

**Department:** Natural Sciences

**Campus:** MLK

**Building:** SCI **Room #:** 216

**Website:** [www.accd.edu/spc/acad/natsci/](http://www.accd.edu/spc/acad/natsci/)

**Course Name:** PHYS 1305 - Introduction to Physics

**Office Number:** (210) 486-2370

## COURSE DESCRIPTION

This course covers the physics of mechanics, heat energy and sound waves using a conceptual approach with little reliance on rigorous mathematical concepts. It is highly recommended for non-science majors, education majors, beginner in allied-health, and engineering programs.

## COURSE PREREQUISITES

None

## STUDENT LEARNING OUTCOMES

The statement of student learning outcomes is designed to bring awareness of what you will be learning and what skills you should be able to demonstrate by way of the acquired knowledge.

At the successful completion of this course, you should be able to demonstrate the following student learning outcomes:

1. Recognize and discuss the basic properties of motion such as speed, velocity, and acceleration.
2. Apply Newton's Laws of motion to determine an object's state of motion or condition of equilibrium.
3. Apply the work-energy theorem and conservation laws of mechanical energy and linear momentum in predicting the changes in motion of an object.
4. Discuss and differentiate among the properties of matter in the solid, liquid, and gas state.
5. Apply the laws of thermodynamics in the analysis of thermal effects such as changed in internal energy, temperature, and heat.
6. Discuss the characteristics of wave motion and their application to sounds.
7. Acquire critical thinking skills to make informed decisions based on scientific findings.

## COURSE OVERVIEW

- I. Mechanics
  - A. Newton's First Law of Motion – Inertia
  - B. Linear Motion
  - C. Newton's Second Law of Motion
  - D. Newton's Third Law of Motion
  - E. Momentum
  - F. Energy
  - G. Rotational Motion
  - H. Gravity
  - I. Projectile and Satellite Motion

1801 Martin Luther King Drive, San Antonio, Texas 78203 (210) 531-3200  
Southwest Campus 800 Quintana Road San Antonio, Texas 78211 (210) 921-4600  
St. Philip's College is a member institution of the [Alamo Community Colleges](#).

## II. Properties of Matter

- A. The Atomic Nature of Matter
- B. Solids
- C. Liquids
- D. Gases and Plasmas

## III. Heat

- A. Temperature, Heat, and Expansion
- B. Heat Transfer
- C. Change of Phase
- D. Thermodynamics

## IV. Sound

- A. Vibrations and Waves
- B. Sound
- C. Musical Sounds

## COURSE OBJECTIVES

### A. Chapter 1

1. State the goals of physics and explain why physics is considered to be a basic science.
2. Distinguish between a scientific claim and speculation.
3.
  - i) State the objectives of the Scientific Method
  - ii) Outline the Steps involved in the Scientific Method.
4. Define the following scientific terms: Hypothesis, Fact Theory, Concept, Prediction, and Law.
5. Distinguish between Science and Technology.

### B. Chapter 2

1. Distinguish between Voilent motion and Natural motion as defined by Aristotle.
2.
  - a. Discuss motion as defined by Galileo
  - b. State the Property of Inertia.
3.
  - a. Define and provide the formula for Speed.
  - b. Distinguish between Instantaneous Speed and Average Speed.
  - c. Use definition of speed to predict useful outcomes of motion (Time and Distance).
4. Define Velocity and differentiate between Velocity and Speed.
5. Define and provide an equation for Acceleration.
6. Define a freely-falling object and discuss the motion of a freely-falling object as given by Aristotle.
7. Discuss the equations of motion for a freely falling object as defined by Galileo.

### C. Chapter 3

1. Distinguish between linear and Non-linear motion.
2. Distinguish between a Vector and a Scalar quantity. Provide examples for each.
3. Discuss Vector Addition / Subtraction for very simple cases.
4. Define a projectile motion and discuss the concept of a projectile motion.

### D. Chapter 4

1. State and discuss Newton's First law of Motion.  
Provide examples to illustrate the first law.

2. Discuss the concept of a force and Net Forces. Show and illustrate the vector nature of forces for very simple cases.
3. State and discuss Newton's Second law.
4. Distinguish between mass and weight.
5. Discuss the non-free fall motion for which acceleration is less than gravity. Define Terminal velocity for a non-free fall motion.
6. State Newton's Third law and provide examples to illustrate the law. Provide examples of action and reaction forces.
7. Discuss the concept of Frictional forces. State the types, relevance, and conditions upon which frictional forces depend on.

E. Chapter 5

1. Define linear momentum and discuss the vector nature of linear momentum.
2. Define and discuss the concept of Impulse and show how an object's momentum can change.
3. Discuss and provide examples on how to produce an increasing momentum and a decreasing momentum by varying the time.
4. Define the term conservation and state the conservation law of momentum.
5. Use the definition of Impulse and Newton's third law to establish the conservation law of momentum. Give examples on how the conservation law can yield information about collisions.

F. Chapter 6

1. Outline the various forms of energy.
2. Define and discuss the concept of kinetic energy.
3. Calculate the kinetic energy of a moving object and introduce the joule as an energy unit. Give examples to illustrate the size of the joule.
4. Discuss the conservation of kinetic energy by defining and discussing the concept of elastic and inelastic collisions.
5.
  - i. Discuss situations where an object's kinetic energy can change.
  - ii. Define and discuss the concept of work.
  - iii. Show that for an object starting at rest the change in kinetic energy is equal to the work done.
6. Distinguish between positive, negative and zero net work.
7. Compare momentum and kinetic energy.
8.
  - i. Define and discuss the concept of gravitational potential energy.
  - ii. Calculate the potential energy of a falling object
  - iii. Show that if only gravity is acting on an object, then the change in potential energy is the same as the work done by gravity on the object.
9. Define mechanical energy and state the conservation law of mechanical energy. Provide examples on the conservation law.
10. Define and discuss the concept of power. Distinguish between Watt and Horse power (units for power measurements).

G. Chapter 7

1. Define, calculate and provide analogies between rotational and translational motion when discussing the following concepts:
  - a. Angular distance
  - b. Angular Speed and Velocity
  - c. Angular Acceleration
  - d. Rotational Inertia
  - e. Torque

- f. Conditions for Rotational equilibrium
- g. Angular Momentum
- h. Conservation of Angular Momentum
2.
  - a. Define and discuss the concept of center of mass and gravity.
  - b. State the conditions for the stability of an object.
  - c. Discuss how to locate the center of gravity of an irregular object using an experiment.
3.
  - a. Define and discuss the concept of circular motion.
  - b. Define and calculate centripetal force and acceleration.

#### H. Chapter 8

1. State and discuss Keplers laws.
2.
  - a. Provide a historical account of reasoning for the commonality of acceleration of an apple and of the moon.
  - b. State and discuss the Inverse-Square law.
3. State and discuss the Universal law of Gravitation and discuss the measurement of the Universal Gravitational constant.
4. Define weightlessness and discuss the conditions for weightlessness.
5. Define and discuss the concept of Gravitational fields.
6. Discuss the formation of ocean tides.
7. Define and discuss the formation of black holes.

#### I. Chapter 9

1. Discuss the following concepts for points along the path of a circular motion and elliptical motion.
 

a. Mechanical Energy	e. Potential Energy
b. Kinetic Energy	f. Gravitational Force
c. Speed and Velocity	g. Acceleration
d. Linear momentum	h. Angular Momentum

#### J. Chapter 10

1. Describe and provide some very basic facts about atoms and molecules.
2. Define and differentiate between a mixture and a compound.
3. State and discuss the law of definite proportions.
4. State and discuss Avogadro's principle and the theory of relative masses.
5. Describe the Bohr atomic model in its simplest form.
6. Discuss and distinguish among the different states of matter.

#### K. Chapter 11

1. Define, discuss and calculate the density of objects and show that density is an intrinsic property.
2. Define elasticity and state and discuss Hookes law.
3. Differentiate among Tension, Compression, and neutral layer as applied to materials.

#### L. Chapter 12

1. Define pressure and distinguish pressure from force.
2. Define pressure in a liquid and discuss pressure variation with depth for a fluid.
3. Define bouyant force. Explain why some objects sink while others float in a liquid using the concepts of bouyant force and force of gravity. Also, explain the concepts of sinking and floating using density effects.

4. State and discuss Archimedes principle. Also, state and discuss the law of floatation.
5. State and discuss Pascal's principle.
6. Define and discuss surface tension effects. Differentiate between adhesion and cohesion forces and explain capillarity action.

M. Chapter 13

1. Define atmospheric pressure.
2. Discuss the measurement of pressure using the mercury barometer, open and closed-tube manometer, and aneroid barometer.
3. State and discuss Boyles law.
4. Apply Archimedes principle to the bouyancy of air.
5. State and discuss Bernoulli's principle.

N. Chapter 14 & 15

1. State the zeroth law of thermodynamics and establish the law as the basis for defining temperature.
2.
  - a. Define temperature in very simple terms and explain the need for temperature scales.
  - b. Outline the physical properties upon which thermometers for temperature measurement depend on.
  - c. Outline the calibration procedure for thermometers
3. Discuss the 3 types of temperature scales: Celsius, Fahrenheit and Kelvin (Absolute).
4.
  - a. Define and discuss the concept of heat energy.
  - b. Define and discuss the concept of internal energy.
  - c. Differentiate between heat and temperature
5. Define and discuss the concept of heat capacity and specific heat capacity.
6. Define and discuss the concept of linear expansion and relate some of its applications
7. Discuss the anomalous expansion of water
8.
  - a. State and discuss the 3 types of mechanisms for heat transfer:  
1) Conduction 2) Convection 3) Radiation
  - b. Discuss the greenhouse effect.

O. Chapter 17

1. State and discuss the first law of thermodynamics. Solve simple problems involving the first law.
2.
  - a. State and discuss the second law of thermodynamics as applied to the following:
    - 1) Heat engines
    - 2) Refrigerators (or A/C units or pumps) and
    - 3) The concept of entropy.
  - b. Define efficiencies for Heat engines and refrigerators.

**TEXTBOOKS AND REQUIRED MATERIALS**

- Conceptual Physics, 10<sup>th</sup> edition, by Paul Hewitt. Pearson/Addison Wesley, 2006.
- Scientific Calculator, Notebook, Ruler, and Pencil

## PERFORMANCE MEASUREMENTS

The course grade will be computed as follows:

3 Tests and Final Examination	= 60%
Homework/Quizzes	= 35%
Research Paper/Class Participation	= 5%

Each test will consist of multiple choice questions. The student may use a formula sheet to be provided during the testing period. Learning objectives pertaining to each chapter will define the extent of coverage for any topic and also the expectations for any test. Any form of dishonesty will not be tolerated on any test or exam and will result in a zero grade.

Students are expected to prepare for class by reading the assigned chapters in the textbook before the beginning of the class period. The student is responsible for all the assigned material even if the assigned material is not covered in class.

There will be about 13 homework assignments (and or quizzes). The homework grade will be based on the best 11 homework assignments (and or quizzes). Homework assignments are due at the end of each week. Any late homework without any tangible excuse will not be accepted. Discussion of homework assignments with colleagues is permitted but no copied homework will be accepted.

The class participation grade will be based on the student's ability to stay focused on class activities and to contribute to the class activities.

Grading Scale: A	90-100
B	80-89
C	70-79
D	60-69
F	0-59

## STUDENT RESPONSIBILITIES

### A. Attendance

Regular and punctual class and laboratory attendance, day and/or evening, is required. A student who is absent for any reason will be allowed to do makeup work at the discretion of the instructor. A student will be held responsible for lecture materials when covered on subsequent examinations. An excused absence will apply only to a student representing the school in an official capacity approved by the administration. Absences of a student are recorded from the official date of enrollment in the class. **A student who has accumulated absences equivalent to two (2) weeks of instruction may be dropped by the instructor after the census date.** If a student is dropped from a class for excessive absences, the instructor will record a grade of "WN" (Withdrew for non-attendance).

### B. Tardiness

Since tardiness is a form of absenteeism, the instructor may establish a policy regarding tardiness.

### C. Plagiarism

In conjunction with **The Student Code of Conduct**, "scholastic dishonesty involving, but not limited to, cheating on a test, plagiarism and collusion" are a violation and will not be tolerated. Students may be subject to disciplinary proceedings resulting in an academic penalty or disciplinary penalty for academic dishonesty. Academic Dishonesty includes, but is not limited to, cheating on a test, plagiarism and collusion. For additional information, refer to the "Student Code of Conduct" in the St. Philip's College Student Handbook.

**D. ADA Statement for Students Requiring Special Accommodations**

As per Section 504 of the Vocational Rehabilitation Act of 1973 and the Americans with Disabilities Act (ADA) of 1990, if special accommodations are needed by any St. Philip's College student, please contact the office of Educational Support Services, at (210) 531-3512, located in the Norris Technical Building, Room 106.

**Additional syllabus information:**

Supplementary Material:

- Practicing Physics to Accompany Conceptual Physics by Paul G. Hewitt. 10<sup>th</sup> Edition, 2006.
- Inquiry Into Physics by Donald J. Bord, 4<sup>th</sup> Edition.
- Videotapes on Physics from St. Philip's College Library

Disability: If you have a disability which compromises your performance in the classroom, please let me know so that we can seek assistance in a timely manner.

Conference: The instructor will be available for student help (tutorial) at a time to be announced later.