



South Central College

PHYS 211 Principles of Physics I

Common Course Outline

Course Information

Description	This is the first half of a one-year sequence in physics. It covers the general background in algebra-based physics. Topics include classical mechanics, fluid mechanics, wave and sound, thermal physics. Lecture and laboratory. (MNTC: 3 Natural Science) (Prerequisites: Math 120 and Math 125, or Math 130)
Total Credits	4
Total Hours	80

Types of Instruction

Instruction Type

Lecture

Lab

Credits/Hours

Pre/Corequisites

Prerequisite Prerequisite: Math 120 and Math 125, or Math 130

Course Competencies

1. Describe basic tools of simple physics

Learning Objectives

Tell the standard units of length, mass and time
Analysis dimension of physics objects
Estimate order of magnitude and significant figures
Describe the difference between scalar and vector

2. Review one dimensional kinematics

Learning Objectives

Distinguish distance and displacement
Calculate speed and velocity
Define and calculate acceleration
Describe motion with constant acceleration

3. Calculate physics quantities with vector properties

Learning Objectives

Decompose vectors into components
Represent displacement, velocity and acceleration by vectors
Add and subtract vectors

4. Describe two dimensional kinematics

Learning Objectives

List the basic equations of projectile motion
Decompose displacement and velocity vectors in projectile motion
Describe the key characteristics of projectile motion

5. Apply Newton's laws of motion

Learning Objectives

Define force and mass
Describe Newton's laws of motion
Distinguish mass and weight
Study normal force, frictional forces and elastic force
Define the key physics quantities in circular motion

6. Define work and energy

Learning Objectives

Investigate works done by various forces
Calculate power
Define kinetic energy, potential energy
Describe conservation of mechanic energy

7. Investigate impulse and linear momentum

Learning Objectives

Define impulse and linear momentum
Describe impulse-momentum theorem
Describe conservation of linear momentum
Investigate elastic and inelastic collisions
Find center of mass in a system
Study systems with changing mass

8. Study rotational motion

Learning Objectives

Define angular displacement, velocity and acceleration
Calculate moment of inertia
Compute rotational kinetic energy
Define torque
Describe conditions of static equilibrium
Investigate angular momentum and the conservation of angular momentum

9. Analyze basic gravity phenomenon

Learning Objectives

State Newton's law of universal gravitation
Compute the gravitational attraction of spherical bodies
Describe Kepler's laws of orbital motion
Calculate gravitational potential energy
Demonstrate tidal behaviors

10. Describe oscillations

Learning Objectives

Define period and frequency
Illustrate simple harmonic motion
Analyze energy changes in oscillations
Describe damped oscillations
Depict driven oscillations and resonance

11. Examine waves and sound

Learning Objectives

Distinguish transverse and longitudinal waves
Define wavelength and speed of wave

Analyze sound waves
Demonstrate the Doppler effect
Describe superposition and interference
Depict standing waves

12. Study fluid mechanics

Learning Objectives

Define density and pressure
Show relation between pressure and depth in fluids
Demonstrate buoyant force
Apply Archimedes' principle
Examine Bernoulli's equation

13. Investigate heat and temperature

Learning Objectives

List temperature scales
Describe thermal expansion
Calculate specific heat
Depict conduction, convection and radiation

14. Demonstrate phases and phase changes

Learning Objectives

List different phases of matter
Describe ideal gas
Describe phase changes
Calculate latent heat

15. Describe the laws of thermodynamics

Learning Objectives

Describe the laws of thermodynamics
Illustrate various thermal processes
Analyze heat engine and the Carnot cycle
Define entropy