



Western Technical College

10806154 General Physics 1

Course Outcome Summary

Course Information

Description	Presents the applications and theory of basic physics principles. This course emphasizes problem-solving, laboratory investigation, and applications. Topics include unit conversion and analysis, vectors, translational and rotational kinematics, translational and rotational dynamics, heat and temperature, and harmonic motion and waves.
Instructional Level	Associate Degree Courses
Total Credits	4
Total Hours	90

Textbooks

Physics - Modified Mastering Physics with Pearson eText – Standalone Access Card. 5th Edition. Copyright 2017. Walker, James S. Publisher: Pearson. **ISBN-13:** 978-0-13-401972-7. Required.

Learner Supplies

Safety Glasses with side eye protection, ANSI Z87.1, Pyramex Venture II or Pyramex OTS. **Vendor:** Campus Shop. Required.

Scientific calculator – TI-30XIIS or TI-36x Solar. **Vendor:** Campus Shop. Required.

Success Abilities

1. Cultivate Passion: Expand a Growth-Mindset
2. Live Responsibly: Embrace Sustainability
3. Live Responsibly: Foster Accountability
4. Refine Professionalism: Act Ethically
5. Refine Professionalism: Improve Critical Thinking
6. Refine Professionalism: Participate Collaboratively
7. Refine Professionalism: Practice Effective Communication

Course Competencies

1. Solve problems involving unit conversion and unit analysis.

Assessment Strategies

- 1.1. quizzes/exams
- 1.2. lab activities

Criteria

You will know you are successful when

- 1.1. you use the conversion factor method to make correct conversions.
- 1.2. you show the steps used to solve the problem.
- 1.3. you include correct units of measure in your answer.

Learning Objectives

- 1.a. Apply International System and US Conventional System base units of measure.
- 1.b. Construct SI derived units.
- 1.c. Use scientific notation to write numbers.
- 1.d. Apply rules regarding significant figures.
- 1.e. Express numeric answers to correct number of significant figures.
- 1.f. Investigate measurement concepts and practices.

2. Perform vector analysis.

Assessment Strategies

- 2.1. quizzes/exams
- 2.2. lab activities

Criteria

You will know you are successful when

- 2.1. you add and subtract vectors using component method.
- 2.2. you convert between rectangular and polar form.
- 2.3. you show the steps used to solve the problem.
- 2.4. you include correct units of measure in your answer.

Learning Objectives

- 2.a. Distinguish between scalar and vector quantities.
- 2.b. Resolve vectors into rectangular coordinates.
- 2.c. Calculate the magnitude and direction of a vector given its rectangular components.
- 2.d. Add vectors graphically.
- 2.e. Add vectors analytically.

3. Apply the laws of translational kinematics.

Assessment Strategies

- 3.1. quizzes/exams
- 3.2. lab activities

Criteria

You will know you are successful when

- 3.1. you solve problems involving displacement, velocity, acceleration, and time.
- 3.2. you show the steps used to solve the problem.
- 3.3. you include correct units of measure in your answer.

Learning Objectives

- 3.a. Calculate distance and average speed.
- 3.b. Calculate displacement and velocity.
- 3.c. Calculate average acceleration.
- 3.d. Solve various one-dimensional kinematics problems.
- 3.e. Solve problems involving free fall kinematics.
- 3.f. Interpret two-dimensional kinematics equations.
- 3.g. Examine curvilinear motion in two dimensions (constant acceleration in one direction of motion).

3.h. Calculate position and velocity of an object in projectile motion.

4. Apply the laws of translational dynamics.

Assessment Strategies

- 4.1. quizzes/exams
- 4.2. lab activities

Criteria

You will know you are successful when

- 4.1. you draw an accurate freebody or motion diagram representing the problem.
- 4.2. you use the freebody diagram to solve for unknowns.
- 4.3. you correctly solve uniform circular motion problems .
- 4.4. you show the steps used to solve the problem.
- 4.5. you include correct units of measure in your answer.

Learning Objectives

- 4.a. Interpret Newton's first law of motion.
- 4.b. Interpret Newton's second law of motion in one dimension.
- 4.c. Interpret Newton's third law of motion.
- 4.d. Apply Newton's second law of motion to dynamic systems in one dimension.
- 4.e. Draw free-body diagrams for each object in a dynamic or static system.
- 4.f. Apply Newton's second law of motion to dynamic systems in two dimensions.
- 4.g. Apply Newton's second law of motion to systems in one- and two-dimensional translational equilibrium.
- 4.h. Apply the properties of friction.

5. Solve problems using concepts of work, energy, and power.

Assessment Strategies

- 5.1. quizzes/exams
- 5.2. lab activities

Criteria

You will know you are successful when

- 5.1. you accurately calculate work.
- 5.2. you accurately calculate power.
- 5.3. you accurately calculate kinetic energy.
- 5.4. you accurately calculate potential energy.
- 5.5. you solve problems using the law of conservation of energy.
- 5.6. you show the steps used to solve the problem.
- 5.7. you include correct units of measure in your answer.

Learning Objectives

- 5.a. Apply the definition of work.
- 5.b. Examine kinetic energy of a mechanical system.
- 5.c. Examine the potential energy of a mechanical system.
- 5.d. Apply the law of conservation of energy.
- 5.e. Apply the definition of power.

6. Solve problems based on the principle of conservation of momentum.

Assessment Strategies

- 6.1. quizzes/exams
- 6.2. lab activities

Criteria

You will know you are successful when

- 6.1. you accurately calculate momentum.
- 6.2. you solve problems using the law of conservation of momentum.
- 6.3. you show the steps used to solve the problem.
- 6.4. you include correct units of measure in your answer.

Learning Objectives

- 6.a. Apply the concept of momentum of a particle and the relation between the resultant force on a particle and the time rate of change of its momentum.
- 6.b. Apply conservation of momentum to one-dimensional motion.
- 6.c. Distinguish the two types of collisions that can occur between two particles, namely elastic and inelastic collisions.
- 6.d. Apply conservation of momentum to two-dimensional motion.

7. Apply the laws of rotational kinematics.

Assessment Strategies

- 7.1. quizzes/exams
- 7.2. lab activities

Criteria

You will know you are successful when

- 7.1. you solve problems involving angular displacement, angular velocity, angular acceleration, and time.
- 7.2. you show the steps used to solve the problem.
- 7.3. you include correct units of measure in your answer.

Learning Objectives

- 7.a. Examine angular displacement and arc length.
- 7.b. Examine angular velocity and tangential velocity.
- 7.c. Examine the properties of centripetal acceleration and centripetal force.
- 7.d. Calculate angular acceleration.
- 7.e. Apply Newton's universal law of gravity.

8. Apply the laws of rotational dynamics.

Assessment Strategies

- 8.1. quizzes/exams
- 8.2. lab activities

Criteria

You will know you are successful when

- 8.1. you draw an accurate freebody or motion diagram representing the problem.
- 8.2. you use the freebody diagram to solve for unknowns.
- 8.3. you accurately calculate moment of inertia.
- 8.4. you accurately calculate rotational kinetic energy.
- 8.5. you accurately calculate work.
- 8.6. you accurately calculate power.
- 8.7. you solve problems using the law of conservation of energy.
- 8.8. you show the steps used to solve the problem.
- 8.9. you include correct units of measure in your answer.

Learning Objectives

- 8.a. Examine the properties of an object that is rolling without slipping.
- 8.b. Investigate the properties of torque.
- 8.c. Investigate Newton's second law of motion for a system of particles rotating about a specific axis.
- 8.d. Investigate mechanical systems in rotational and translational equilibrium.
- 8.e. Examine rotational work, kinetic energy, and power.
- 8.f. Examine conservation of angular momentum.

9. Solve problems involving properties of solids and fluids.

Assessment Strategies

- 9.1. quizzes/exams
- 9.2. lab activities

Criteria

You will know you are successful when

- 9.1. you accurately calculate pressure.
- 9.2. you apply Archimedes' Principle.

- 9.3. you solve problems in fluid dynamics.
- 9.4. you solve problems involving the deformation of solids.

Learning Objectives

- 9.a. Investigate the relationship between stress, strain, and Young's modulus.
- 9.b. Examine fluid pressure.
- 9.c. Examine Pascal's principle.
- 9.d. Calculate buoyant force using Archimedes' principle.
- 9.e. Analyze flow speed using the continuity equation.
- 9.f. Explore the principles of ideal fluid dynamics and Bernoulli's equation.

10. Solve problems involving heat and temperature.

Assessment Strategies

- 10.1. quizzes/exams
- 10.2. lab activities

Criteria

You will know you are successful when

- 10.1. you convert temperatures.
- 10.2. you solve problems related to specific heat and latent heat.
- 10.3. you solve problems related to heat transfer.
- 10.4. you solve problems related to the gas laws.
- 10.5. you solve problems related to thermal expansion.
- 10.6. you solve problems involving the First Law of Thermodynamics.

Learning Objectives

- 10.a. Differentiate between temperature and heat.
- 10.b. Identify degrees Celsius and Rankine as temperature scales.
- 10.c. Investigate the ideal gas law.
- 10.d. Apply linear thermal expansion of solids.
- 10.e. Investigate various units of heat, e.g. joules, British thermal units (Btu), and calories.
- 10.f. Calculate heat loss or heat gain of matter in a single phase due to temperature change and specific heat.
- 10.g. Calculate the heat causing a phase change of a material using latent heat.
- 10.h. Examine the three types of heat transfer (conduction, convection, and radiation).

11. Solve problems involving simple harmonic motion and waves.

Assessment Strategies

- 11.1. quizzes/exams
- 11.2. lab activities

Criteria

You will know you are successful when

- 11.1. you solve problems related to simple harmonic motion.
- 11.2. you solve problems involving frequency, amplitude, wavelengths, and wave speed.
- 11.3. you describe interference and resonance.
- 11.4. you solve problems involving sound intensity levels.
- 11.5. you solve problems using the Doppler effect.

Learning Objectives

- 11.a. Examine the equations of motion for simple harmonic motion.
- 11.b. Apply the equations of motion for simple harmonic motion to wave motion.
- 11.c. Define the two types of mechanical waves (transverse and longitudinal).
- 11.d. Examine wave phenomena (reflection, refraction, diffraction, and dispersion).
- 11.e. Investigate fundamental frequency, harmonic frequencies, and resonance.
- 11.f. Calculate the speed of sound in solids, liquids, and air.