Whitehall-Coplay School District Syllabus

Course Title: College Preparatory Physics Grade: 11/12

DESCRIPTION OF COURSE: Students will study the fundamental laws that govern physical, chemical, and biological processes. Topics covered will include Newton's Laws of Motion, Momentum, Energy, Waves, and Light and Optics. Students will demonstrate their knowledge by using the computer, participating in laboratory investigations, homework, projects, quizzes and tests.

REQUIRED TOPICS OF STUDY	SUGGESTED INSTRUCTIONAL TIME	STANDARDS/ ELIGIBLE CONTENT
Problem-Solving and Math Review	1 week	SEP 2,4,5; CC 1,3
Representing Motion	2-3 weeks	3.2.9-12.I; 3.2.9-12.P; SEP 2,4,5; CCC 1,3
Accelerated Motion	3-4 weeks	3.2.9-12.I; 3.2.9-12.P; SEP 2,4,5; CCC 1,3
Forces in One Dimension	4-5 weeks	3.2.9-12.I; SEP 4, CCC 2
Forces in Two Dimensions	4-5 weeks	3.2.9-12.I; SEP 4, CCC 2
Motion in Two Dimensions	3-4 weeks	3.2.9-12.I; 3.2.9-12.P; SEP 2,4,5; CCC 1,3
Gravitation	2-3 weeks	3.2.9-12.L; SEP 4,5; CCC 3,8
Momentum and Its Conservation	2-3 weeks	3.2.9-12.J.;3.2.9-12.K.; SEP 1,2,3,4,5,6; CCC 2,5
Energy and Its Conservation	3-4 weeks	3.2.9-12.O, 3.2.9-12.P., 3.2.9-12.Q.; SEP 2,3, CCC 4,5,8
Vibrations and Waves	2-3 weeks	3.2.9-12. T, 3.2.9-12.V, SEP 3,4,5; CCC 1,2,6.
Light and Optics	2 weeks	3.2.9-12.T, 3.2.9-12.V

RESOURCES: "Physics - Principles & Problems" by Paul W. Zitzewitz, et al. ©2009 by McGraw-Hill companies; Vernier Laboratory suite, PhET and other computer simulations. Google Classroom is used extensively for announcements and homework.

May, 2026

Quick Links:

1. Pre-Unit 1 -
2. Unit 1 -
3. Unit 2 -
4. Unit 3 -
5. Unit 4 -
6. Unit 5 -
7. Unit 6 -
8. Unit 7 -
9. Unit 8 -
10. Unit 9
11. Unit 10 -

May, 2026

Whitehall-Coplay School District Course Guide

Course Title: C.P. Physics **Pre- Unit #1 - Problem-solving and math review** **Grade/Level: 11-12**
Textbook(s): "Physics - Principles & Problems" by Paul W. Zitzewitz, et al.
Digital Software: Vernier Laboratory Suite, PhET, Google Classroom

Science and Engineering Practices(SEP) are behaviors that are critical in investigating, modeling and explaining the world, as well as in developing solutions to societal problems.

1. Asking questions (for science) and defining problems (for engineering);
2. Developing and using models;
3. Planning and carrying out investigations;
4. Analyzing and interpreting data;
5. Using mathematics and computational thinking;
6. Constructing explanations (for science) and designing solutions (for engineering);
7. Engaging in argument from evidence; and
8. Obtaining, evaluating and communicating information.

Crosscutting Concepts (CCC) serve as a framework for students to connect knowledge from different fields and develop a coherent view of the natural world.

1. Patterns
2. Cause and Effect
3. Scale, Proportion, and Quantity
4. Systems and System Models
5. Energy and Matter: Flows, Cycles, and Conservation
6. Structure and Function
7. Stability and Change
8. Connections to Nature of Science

STEELS Standard:

Lesson	Days	Concepts/Topics	DCI	Key Terms	Resources: Activities, Materials, Digital & Print Resources	Assessments
1	1	Algebra Review			Google slides, notes pages	Quiz, Self-assessment
2	1	Significant figures, scientific notation, metric review		Significant figure, scientific notation,	Google slides, notes pages, problem sets	Quiz, Self-assessment

				metric, base unit, derived unit		
3	2	Review/Test			Google slides, notes pages, problem sets	Unit test

Whitehall-Coplay School District Course Guide

Course Title: C.P. Physics **Unit #1 - Representing Motion** **Grade/Level: 11-12**
Textbook(s): "Physics - Principles & Problems" by Paul W. Zitzewitz, et al.
Digital Software: Vernier Laboratory Suite, PhET, Google Classroom

Science and Engineering Practices (SEP) are behaviors that are critical in investigating, modeling and explaining the world, as well as in developing solutions to societal problems.

1. Asking questions (for science) and defining problems (for engineering);
2. Developing and using models;
3. Planning and carrying out investigations;
4. Analyzing and interpreting data;
5. Using mathematics and computational thinking;
6. Constructing explanations (for science) and designing solutions (for engineering);
7. Engaging in argument from evidence; and
8. Obtaining, evaluating and communicating information.

Crosscutting Concepts (CCC) serve as a framework for students to connect knowledge from different fields and develop a coherent view of the natural world.

1. Patterns
2. Cause and Effect
3. Scale, Proportion, and Quantity
4. Systems and System Models
5. Energy and Matter: Flows, Cycles, and Conservation
6. Structure and Function
7. Stability and Change
8. Connections to Nature of Science

STEELS Standard(s):

1. 3.2.9-12.I - Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
2. 3.2.9-12.P - Develop and used models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).

Lesson	Days	Concepts/Topics	DCI	Key Terms	Resources: Activities, Materials, Digital & Print Resources	Assessments
1	1	Introduction to motion		Direction, displacement,	Google slides, notes	Daily: Bell ringer and

				distance, magnitude, scalar, vector, velocity	pages, problem sets	Exit ticket
2	4	Constant velocity motion		Direction, displacement, distance, magnitude, scalar, vector, velocity	Google slides, notes pages, Vernier Lab 1	Problem Set; lab report
5	2	Review and Assessment		Direction, displacement, distance, magnitude, scalar, vector, velocity	Review sheet	Unit Test

Whitehall-Coplay School District Course Guide

Course Title: C.P. Physics **Unit #2 - Accelerated Motion** **Grade/Level: 11-12**
Textbook(s): "Physics - Principles & Problems" by Paul W. Zitzewitz, et al.
Digital Software: Vernier Laboratory Suite, PhET, Google Classroom

Science and Engineering Practices (SEP) are behaviors that are critical in investigating, modeling and explaining the world, as well as in developing solutions to societal problems.

1. Asking questions (for science) and defining problems (for engineering);
2. Developing and using models;
3. Planning and carrying out investigations;
4. Analyzing and interpreting data;
5. Using mathematics and computational thinking;
6. Constructing explanations (for science) and designing solutions (for engineering);
7. Engaging in argument from evidence; and
8. Obtaining, evaluating and communicating information.

Crosscutting Concepts (CCC) serve as a framework for students to connect knowledge from different fields and develop a coherent view of the natural world.

1. Patterns
2. Cause and Effect
3. Scale, Proportion, and Quantity
4. Systems and System Models
5. Energy and Matter: Flows, Cycles, and Conservation
6. Structure and Function
7. Stability and Change
8. Connections to Nature of Science

STEELS Standard(s):
3.2.9-12.I - Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
3.2.9-12.P - Develop and used models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).

Lesson	Days	Concepts/Topics	DCI	Key Terms	Resources: Activities, Materials, Digital & Print Resources	Assessments

May, 2026

1	1	Introduction to motion		Direction, displacement, distance, magnitude, scalar, vector, velocity	Google slides, notes pages, problem sets	Daily: Bell ringer and Exit ticket
3	2	Constant acceleration motion		Acceleration, direction, displacement, distance, magnitude, scalar, vector, velocity	Google slides, notes pages, Vernier Lab 2	Problem Set, lab report; quiz
4	2	Constant acceleration motion, vertical		Acceleration, direction, displacement, distance, free-fall, magnitude, scalar, vector, velocity	Google slides, notes pages, Vernier Lab 3	Problem Set, Lab, report
5	2	Review and Assessment		Acceleration, direction, displacement, distance, magnitude, scalar, vector, velocity	Review sheet	Unit Test

Whitehall-Coplay School District Course Guide

Course Title: C.P. Physics **Unit #3 - Forces in One Dimension** **Grade/Level: 11-12**
Textbook(s): "Physics - Principles & Problems" by Paul W. Zitzewitz, et al.
Digital Software: Vernier Laboratory Suite, PhET, Google Classroom

Science and Engineering Practices (SEP) are behaviors that are critical in investigating, modeling and explaining the world, as well as in developing solutions to societal problems.

1. Asking questions (for science) and defining problems (for engineering);
2. Developing and using models;
3. Planning and carrying out investigations;
4. Analyzing and interpreting data;
5. Using mathematics and computational thinking;
6. Constructing explanations (for science) and designing solutions (for engineering);
7. Engaging in argument from evidence; and
8. Obtaining, evaluating and communicating information.

Crosscutting Concepts (CCC) serve as a framework for students to connect knowledge from different fields and develop a coherent view of the natural world.

1. Patterns
2. Cause and Effect
3. Scale, Proportion, and Quantity
4. Systems and System Models
5. Energy and Matter: Flows, Cycles, and Conservation
6. Structure and Function
7. Stability and Change
8. Connections to Nature of Science

STEELS Standard(s):
3.2.9-12.I - Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
3.2.9-12.L - Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.
3.2.9-12.N - Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

Lesson	Days	Concepts/Topics	DCI	Key Terms	Resources: Activities, Materials,	Assessments

					Digital & Print Resources	
1	1	Introduction	Newton's Second Law accurately predicts the changes in the motion of macroscopic objects Forces an a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space.	Force, system, speed, velocity, acceleration, mass, net force, vector, scalar, magnitude	Google slides and notes pages	
2	1-2	Free-body diagrams	Newton's Second Law accurately predicts the changes in the motion of macroscopic objects Forces an a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space.	Force, system, speed, velocity, acceleration, mass, net force, vector, scalar, magnitude	Google slides and notes pages, problem sets	quiz
3	2-3	Net force	Newton's Second Law accurately predicts the changes in the motion of macroscopic objects Forces an a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space.	Force, system, speed, velocity, acceleration, mass, net force, vector, scalar, magnitude	Google slides and notes pages, problem sets	quiz
4	2-3	Newton's Laws	Newton's Second Law accurately predicts the changes in the motion of macroscopic objects Forces an a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space.	Force, system, speed, velocity, acceleration, mass, net force, vector, scalar, magnitude	Google slides and notes pages, problem sets, Newton's laws labs	Lab reports
5	2	Applications of Newton's Laws	Newton's Second Law accurately predicts the changes in the motion of macroscopic objects	Force, system, speed, velocity, acceleration,	Google slides and notes pages, problem sets	quiz

			Forces an a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space.	mass, net force, vector, scalar, magnitude		
7	1	Assessment	All DCI’s are addressed	Force, system, speed, velocity, acceleration, mass, net force, vector, scalar, magnitude		Unit test

Whitehall-Coplay School District Course Guide

Course Title: C.P. Physics **Unit #4 - Forces in Two Dimensions** **Grade/Level: 11-12**
Textbook(s): "Physics - Principles & Problems" by Paul W. Zitzewitz, et al.
Digital Software: Vernier Laboratory Suite, PhET, Google Classroom

Science and Engineering Practices (SEP) are behaviors that are critical in investigating, modeling and explaining the world, as well as in developing solutions to societal problems.

1. Asking questions (for science) and defining problems (for engineering);
2. Developing and using models;
3. Planning and carrying out investigations;
4. Analyzing and interpreting data;
5. Using mathematics and computational thinking;
6. Constructing explanations (for science) and designing solutions (for engineering);
7. Engaging in argument from evidence; and
8. Obtaining, evaluating and communicating information.

Crosscutting Concepts (CCC) serve as a framework for students to connect knowledge from different fields and develop a coherent view of the natural world.

1. Patterns
2. Cause and Effect
3. Scale, Proportion, and Quantity
4. Systems and System Models
5. Energy and Matter: Flows, Cycles, and Conservation
6. Structure and Function
7. Stability and Change
8. Connections to Nature of Science

STEELS Standard(s):
3.2.9-12.I - Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
3.2.9-12.L - Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.
3.2.9-12.N - Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

Lesson	Days	Concepts/Topics	DCI	Key Terms	Resources: Activities, Materials,	Assessments

					Digital & Print Resources	
1	1	Introduction	Newton's Second Law accurately predicts the changes in the motion of macroscopic objects Forces an a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space.	Force, system, speed, velocity, acceleration, mass, net force, vector, scalar, magnitude	Google slides and notes pages	
2	3	Vectors, Vector Addition, Vector Components	Newton's Second Law accurately predicts the changes in the motion of macroscopic objects	Acceleration due to gravity, components, cosine and sine	PhET simulation - Vector Labs	Lab report
3	3	Friction	Newton's Second Law accurately predicts the changes in the motion of macroscopic objects Forces an a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space.	Force, system, speed, velocity, acceleration, mass, net force, vector, scalar, magnitude	Google slides and notes pages, problem sets, Friction Labs	Lab reports, quiz
4	1	Assessment	All DCI's are addressed	Force, system, speed, velocity, acceleration, mass, net force, vector, scalar, magnitude		Unit test

Whitehall-Coplay School District Course Guide

Course Title: C.P. Physics **Unit #5 - Motion in Two Dimensions**

Grade/Level: 11-12

Textbook(s): "Physics - Principles & Problems" by Paul W. Zitzewitz, et al.

Digital Software: Vernier Laboratory Suite, PhET, Google Classroom

Science and Engineering Practices (SEP) are behaviors that are critical in investigating, modeling and explaining the world, as well as in developing solutions to societal problems.

1. Asking questions (for science) and defining problems (for engineering);
2. Developing and using models;
3. Planning and carrying out investigations;
4. Analyzing and interpreting data;
5. Using mathematics and computational thinking;
6. Constructing explanations (for science) and designing solutions (for engineering);
7. Engaging in argument from evidence; and
8. Obtaining, evaluating and communicating information.

Crosscutting Concepts (CCC) serve as a framework for students to connect knowledge from different fields and develop a coherent view of the natural world.

1. Patterns
2. Cause and Effect
3. Scale, Proportion, and Quantity
4. Systems and System Models
5. Energy and Matter: Flows, Cycles, and Conservation
6. Structure and Function
7. Stability and Change
8. Connections to Nature of Science

STEELS Standard(s):

3.2.9-12.L - Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

3.2.9-12.P - Develop and used models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).

Lesson	Days	Concepts/Topics	DCI	Key Terms	Resources: Activities, Materials,	Assessments

					Digital & Print Resources	
1	1	Introduction	Newton's Second Law accurately predicts the changes in the motion of macroscopic objects	Acceleration due to gravity, components, cosine and sine	Google slides and notes pages, PhET simulations	Daily: Bell ringer and Exit ticket
2	1	Simulation Lab - Projectile Motion	Newton's Second Law accurately predicts the changes in the motion of macroscopic objects	Acceleration due to gravity, components, cosine and sine	PhET simulation - projectile Lab	Lab report
3	2-3	Projectile Launch Lab	Newton's Second Law accurately predicts the changes in the motion of macroscopic objects	Acceleration due to gravity, components, cosine and sine	Google slides and notes pages	Lab report
4	1-2	Problem Solving - individual and group	Newton's Second Law accurately predicts the changes in the motion of macroscopic objects	Acceleration due to gravity, components, cosine and sine	Google slides and notes pages, problem sets	Problem set and quiz
5	1	Projectile Challenge	Newton's Second Law accurately predicts the changes in the motion of macroscopic objects	Acceleration due to gravity, components, cosine and sine	Challenge directions	Challenge report
6	1-2	Review and Unit test	All DCI's are addressed	Acceleration due to gravity, components, cosine and sine	Unit test	Unit test

Whitehall-Coplay School District Course Guide

Course Title: C.P. Physics **Unit #6 - Gravitation** **Grade/Level: 11-12**
Textbook(s): "Physics - Principles & Problems" by Paul W. Zitzewitz, et al.
Digital Software: Vernier Laboratory Suite, PhET, Google Classroom

Science and Engineering Practices (SEP) are behaviors that are critical in investigating, modeling and explaining the world, as well as in developing solutions to societal problems.

1. Asking questions (for science) and defining problems (for engineering);
2. Developing and using models;
3. Planning and carrying out investigations;
4. Analyzing and interpreting data;
5. Using mathematics and computational thinking;
6. Constructing explanations (for science) and designing solutions (for engineering);
7. Engaging in argument from evidence; and
8. Obtaining, evaluating and communicating information.

Crosscutting Concepts (CCC) serve as a framework for students to connect knowledge from different fields and develop a coherent view of the natural world.

1. Patterns
2. Cause and Effect
3. Scale, Proportion, and Quantity
4. Systems and System Models
5. Energy and Matter: Flows, Cycles, and Conservation
6. Structure and Function
7. Stability and Change
8. Connections to Nature of Science

STEELS Standard(s):
3.2.9-12.L -use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.

May, 2026

Lesson	Days	Concepts/Topics	DCI	Key Terms	Resources: Activities, Materials, Digital & Print Resources	Assessments
1	1	Introduction	Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects. Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields.	Gravity, Newton's Universal Law of Gravitation; Kepler's Laws	Google slides and notes pages,	Daily: Bell ringer and Exit ticket
2	1	Kepler's Laws	Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects. Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields.	Gravity, Newton's Universal Law of Gravitation; Kepler's Laws	Google slides and notes pages; PhET Gravity and Orbits	Lab report
3	2-3	Problem Solving	Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects.	Gravity, Newton's Universal Law of Gravitation; Kepler's Laws	Google slides and notes pages	Problem Sets

			Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields.			
4	1-2	Newton's Universal Law	Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects. Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields.	Gravity, Newton's Universal Law of Gravitation; Kepler's Laws	Google slides and notes pages; PhET Gravity Force Lab	
5	2	Problem Solving	Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects. Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields.	Gravity, Newton's Universal Law of Gravitation; Kepler's Laws	Google slides and notes pages;	Problem set and quiz
6	1-2	Review and Unit test	All DCI's are addressed	Gravity, Newton's Universal Law of Gravitation; Kepler's	Unit test	Unit test

				Laws		

Whitehall-Coplay School District Course Guide

Course Title: C.P. Physics **Unit #7 - Momentum and Its Conservation** **Grade/Level: 11-12**
Textbook(s): "Physics - Principles & Problems" by Paul W. Zitzewitz, et al.
Digital Software: Vernier Laboratory Suite, PhET, Google Classroom

Science and Engineering Practices (SEP) are behaviors that are critical in investigating, modeling and explaining the world, as well as in developing solutions to societal problems.

1. Asking questions (for science) and defining problems (for engineering);
2. Developing and using models;
3. Planning and carrying out investigations;
4. Analyzing and interpreting data;
5. Using mathematics and computational thinking;
6. Constructing explanations (for science) and designing solutions (for engineering);
7. Engaging in argument from evidence; and
8. Obtaining, evaluating and communicating information.

Crosscutting Concepts (CCC) serve as a framework for students to connect knowledge from different fields and develop a coherent view of the natural world.

1. Patterns
2. Cause and Effect
3. Scale, Proportion, and Quantity
4. Systems and System Models
5. Energy and Matter: Flows, Cycles, and Conservation
6. Structure and Function
7. Stability and Change
8. Connections to Nature of Science

STEELS Standard(s):
3.2.9-12.J - Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.
3.2.9-12.K - Apply scientific and engineering ideas to design, evaluate and refine a device that minimizes the force on a macroscopic object during a collision.

Lesson	Days	Concepts/Topics	DCI	Key Terms	Resources: Activities, Materials, Digital & Print Resources	Assessments
1	1	Introduction	Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object. If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes outside the system.	Momentum, impulse, force, conservation, net force, elastic collision, inelastic collision, time	Google slides and notes pages, problem sets, PhET Labs	
2	1-2	Linear Momentum	Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object.	Momentum, impulse, force, conservation, net force, elastic collision, inelastic collision, time	Google slides and notes pages, problem sets,	quiz
3	2-3	Conservation of Momentum in Collisions	Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object. If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes outside the system.	Momentum, impulse, force, conservation, net force, elastic collision, inelastic collision, time	Google slides and notes pages, problem sets, PhET Labs, In-class Labs	quiz
4	1-2	Impulse	Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object. If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes outside the system.	Momentum, impulse, force, conservation, net force, elastic collision, inelastic collision, time	Google slides and notes pages, problem sets, PhET Labs, In-class Labs	quiz
5	2-3	Egg CATCH	Defining and Delimiting an Engineering Problem: Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk	Momentum, impulse, force, conservation, net force, elastic collision, inelastic collision, time	Egg - Catch project	

			mitigation into account, andy they should be qualified to the extent possible and stated in such a way that one can tell if a given design meets them. Optimizing the Design Solution: Criteria may need to be broken down into simpler one that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed.			
6	1	Assessment	All DCI's are addressed	Momentum, impulse, force, conservation, net force, elastic collision, inelastic collision, time		Unit Test

Whitehall-Coplay School District Course Guide

Course Title: C.P. Physics **Unit #8 - Work and Energy** **Grade/Level: 11-12**
Textbook(s): "Physics - Principles & Problems" by Paul W. Zitzewitz, et al.
Digital Software: Vernier Laboratory Suite, PhET, Google Classroom

Science and Engineering Practices (SEP) are behaviors that are critical in investigating, modeling and explaining the world, as well as in developing solutions to societal problems.

1. Asking questions (for science) and defining problems (for engineering);
2. Developing and using models;
3. Planning and carrying out investigations;
4. Analyzing and interpreting data;
5. Using mathematics and computational thinking;
6. Constructing explanations (for science) and designing solutions (for engineering);
7. Engaging in argument from evidence; and
8. Obtaining, evaluating and communicating information.

Crosscutting Concepts (CCC) serve as a framework for students to connect knowledge from different fields and develop a coherent view of the natural world.

1. Patterns
2. Cause and Effect
3. Scale, Proportion, and Quantity
4. Systems and System Models
5. Energy and Matter: Flows, Cycles, and Conservation
6. Structure and Function
7. Stability and Change
8. Connections to Nature of Science

STEELS Standard(s):
3.2.9-12.O - Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
3.2.9-12.P - Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).
3.2.9-12.Q - Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

Lesson	Days	Concepts/Topics	DCI	Key Terms	Resources: Activities, Materials, Digital & Print Resources	Assessments
1	1	Introduction	Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. There is a single quantity called energy due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible form.	Kinetic energy, mechanical energy, potential energy, energy transfer, system, conservation of energy, first law of thermodynamics, second law of thermodynamics, heat, heat transfer	Google slides and notes pages, problem sets, PhET Labs	
2	1-2	Work	Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. There is a single quantity called energy due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible form. At the macroscopic level, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy.	Kinetic energy, mechanical energy, potential energy, energy transfer, system, conservation of energy, first law of thermodynamics, second law of thermodynamics, heat, heat transfer	Google slides and notes pages, problem sets, PhET Labs, In-class Labs	quiz
3	2-3	Kinetic Energy	Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. There is a single quantity called energy due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible form. At the macroscopic level, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy.	Kinetic energy, mechanical energy, potential energy, energy transfer, system, conservation of energy, first law of thermodynamics, second law of thermodynamics, heat, heat transfer	Google slides and notes pages, problem sets, PhET Labs, In-class Labs	quiz

4	1-2	Potential Energy	Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. There is a single quantity called energy due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible form. At the macroscopic level, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy.	Kinetic energy, mechanical energy, potential energy, energy transfer, system, conservation of energy, first law of thermodynamics, second law of thermodynamics, heat, heat transfer	Google slides and notes pages, problem sets, PhET Labs, In-class Labs	quiz
5	1-2	Conservation of Energy	Conservation of Energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system. Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g. relative positions of charged particles, compression of a spring) and kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior. The availability of energy limits what can occur in any system.	Kinetic energy, mechanical energy, potential energy, energy transfer, system, conservation of energy, first law of thermodynamics, second law of thermodynamics, heat, heat transfer	Google slides and notes pages, problem sets, PhET Labs, In-class Labs	
6	1	Non-Conservative Forces	Conservation of Energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system.	Kinetic energy, mechanical energy, potential energy, energy transfer, system, conservation of energy, first law of thermodynamics, second law of thermodynamics,	Google slides and notes pages, problem sets, PhET Labs, In-class Labs	quiz

			Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g. relative positions of charged particles, compression of a spring) and kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior. The availability of energy limits what can occur in any system.	heat, heat transfer		
7	1	Power	Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. There is a single quantity called energy due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible form.	Kinetic energy, mechanical energy, potential energy, energy transfer, system, conservation of energy, first law of thermodynamics, second law of thermodynamics, heat, heat transfer	Google slides and notes pages, problem sets, PhET Labs, In-class Labs	
8	1	Assessment	All DCI's are addressed	Kinetic energy, mechanical energy, potential energy, energy transfer, system, conservation of energy, first law of thermodynamics, second law of thermodynamics, heat, heat transfer		Unit Test

Whitehall-Coplay School District Course Guide

Course Title: C.P. Physics **Unit #9 - Vibrations and Waves** **Grade/Level: 11-12**
Textbook(s): "Physics - Principles & Problems" by Paul W. Zitzewitz, et al.
Digital Software: Vernier Laboratory Suite, PhET, Google Classroom

Science and Engineering Practices (SEP) are behaviors that are critical in investigating, modeling and explaining the world, as well as in developing solutions to societal problems.

1. Asking questions (for science) and defining problems (for engineering);
2. Developing and using models;
3. Planning and carrying out investigations;
4. Analyzing and interpreting data;
5. Using mathematics and computational thinking;
6. Constructing explanations (for science) and designing solutions (for engineering);
7. Engaging in argument from evidence; and
8. Obtaining, evaluating and communicating information.

Crosscutting Concepts (CCC) serve as a framework for students to connect knowledge from different fields and develop a coherent view of the natural world.

1. Patterns
2. Cause and Effect
3. Scale, Proportion, and Quantity
4. Systems and System Models
5. Energy and Matter: Flows, Cycles, and Conservation
6. Structure and Function
7. Stability and Change
8. Connections to Nature of Science

STEELS Standard(s):
3.2.9-12.T - Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
3.2.9-12.V - Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model and that for some situations one model is more useful than the other.

Lesson	Days	Concepts/Topics	DCI	Key Terms	Resources: Activities, Materials, Digital & Print Resources	Assessments
1	1	Introduction	The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing.	Medium, frequency, wave, wavelength, longitudinal wave, transverse wave, wave speed	Google slides and notes pages, problem sets, PhET Labs	
2	1	Properties of Waves	The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing.	Medium, frequency, wave, wavelength, longitudinal wave, transverse wave, wave speed	Google slides and notes pages, problem sets, PhET Labs; In-class lab	quiz
3	1-2	SHM (simple harmonic motion) and SHO's (simple harmonic oscillators)	The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing.	Medium, frequency, wave, wavelength, longitudinal wave, transverse wave, wave speed	Google slides and notes pages, problem sets, PhET Labs, In-class Labs	quiz
4	1	Light and Sound	The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing.	Medium, frequency, wave, wavelength, longitudinal wave, transverse wave, wave speed		
5	1	Assessment	All DCI's are addressed	Medium, frequency, wave, wavelength, longitudinal wave, transverse wave, wave speed		Unit Test

Whitehall-Coplay School District Course Guide

Course Title: C.P. Physics **Unit #10 - Optics** **Grade/Level: 11-12**
Textbook(s): "Physics - Principles & Problems" by Paul W. Zitzewitz, et al.
Digital Software: Vernier Laboratory Suite, PhET, Google Classroom

Science and Engineering Practices (SEP) are behaviors that are critical in investigating, modeling and explaining the world, as well as in developing solutions to societal problems.

1. Asking questions (for science) and defining problems (for engineering);
2. Developing and using models;
3. Planning and carrying out investigations;
4. Analyzing and interpreting data;
5. Using mathematics and computational thinking;
6. Constructing explanations (for science) and designing solutions (for engineering);
7. Engaging in argument from evidence; and
8. Obtaining, evaluating and communicating information.

Crosscutting Concepts (CCC) serve as a framework for students to connect knowledge from different fields and develop a coherent view of the natural world.

1. Patterns
2. Cause and Effect
3. Scale, Proportion, and Quantity
4. Systems and System Models
5. Energy and Matter: Flows, Cycles, and Conservation
6. Structure and Function
7. Stability and Change
8. Connections to Nature of Science

STEELS Standard(s):
3.2.9-12.T - Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
3.2.9-12.V - Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model and that for some situations one model is more useful than the other.

Lesson	Days	Concepts/Topics	DCI	Key Terms	Resources: Activities, Materials, Digital & Print Resources	Assessments
1	1	Introduction	The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing.	Reflection, Refraction, Snell's Law, Incidence angle, reflected angle	Google slides and notes pages, problem sets, PhET Labs	
2	1	Properties of Light	The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing.	Reflection, Refraction, Snell's Law, Incidence angle, reflected angle	Google slides and notes pages, problem sets, PhET Labs; In-class lab	quiz
3	1-4	Optics Labs	The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing.	Reflection, Refraction, Snell's Law, Incidence angle, reflected angle	Google slides and notes pages, problem sets, PhET Labs, In-class Labs with Optics kits	quiz
4	1	Assessment	All DCI's are addressed	Reflection, Refraction, Snell's Law, Incidence angle, reflected angle		Unit Test