COPPELL ISD SUBJECT YEAR AT A GLANCE

PHYSICS

GRADE 11 | **10 UNITS**

Program Transfer Goals

- Ask questions, recognize and define problems, and propose solutions.
- Safely and ethically collect, analyze, and evaluate appropriate data.
- Utilize (create/analyze) models to make predictions and understand the world around them.
- Make valid claims and informed decisions based on scientific evidence.
- Effectively communicate scientific principles and reasoning to a target audience.

PACING

First Grading Period			Second Grading Period			Third Grading Period			Fourth Grading Period		
Unit 1 2 Weeks	Unit 2 3 Weeks	Unit 3 3 Weeks	Unit 4 3.5 Weeks	Unit 5 3.5 Weeks	Exam	Unit 6 3.5 Weeks	Unit 7 3 Weeks	Unit 8 4 Weeks	Unit 9 4 Weeks	Unit 10 2 Weeks	Exam

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Assurances for a Guaranteed and Viable Curriculum

Adherence to this scope and sequence affords every member of the learning community clarity on the knowledge and skills on which each learner should demonstrate proficiency. In order to deliver a guaranteed and viable curriculum, our team commits to and ensures the following understandings:

Shared Accountability: Responding to the Needs of All Learners

- High levels of learning for all students.
- The district and course formative assessments aligned to the standards for this course support educators and learners in monitoring academic achievement and leveraging interventions.

Shared Understanding: Curriculum Design

- The district curriculum design weaves together the elements of content, skills and assessments in order to adhere to curriculum design at the macro and micro level, ensuring vertical alignment.
- The district curriculum incorporates standards, scope and sequence, enduring understandings, essential questions, performance assessments, and recommended resources.

Interdependence: Curriculum Units

Members of the learning community utilize the curriculum units, plan collaboratively, and reflect on results for continuous improvement.

The district curriculum units may be found: http://tinyurl.com/Coppell-Curriculum

Unit 1: Science Skills, Processes, and Safety

Timeline: 2 Weeks - 1st 9 Weeks

Unit Summary: Students will expand safe science practices into physics while exploring experimental design and the mathematical tools that will be used throughout the course.

Transfer Goal: Apply processes and skills from the program level transfer goals in the context of Physics

Students will know…

- The identity and function of various lab equipment.
- Lab safety procedures and equipment.
- The ethical responsibility of appropriate lab behavior.
- How to construct and analyze a graph based on data/data tables.
- The components of a well-written lab report.
- Converting units as appropriate.
- Using and converting scientific notation
- Entering scientific notation on a calculator
- Accuracy vs. Precision in data
- Scientific Method

Students will be skilled at…

- Apply the scientific method to a given problem.
- Choosing the appropriate piece of lab equipment for the task needed.
- Identifying appropriate behavior and safety hazards involved in a lab situation and altering actions accordingly.
- Planning a scientific experiment to answer a question that includes a control, an independent variable, and a dependent variable.
- Writing a detailed and coherent procedure for a scientific experiment.
- Creating graphs and tables to summarize/analyze data sets and observations.
- Writing an appropriate conclusion (CER format).

Unit 2: Kinematics

Timeline: 3 Weeks - 1st 9 Weeks

Unit Summary: Students will explore how objects experience constant motion versus accelerated motion in one dimension while using assumptions and mathematical equations to find unknown information.

Transfer Goal: Recognize the difference between constant motion and accelerated motion for an object.

Students will know…

- The difference between a scalar and vector quantity
- The difference between distance and displacement
- The relationship of speed, distance and time variables.
- The difference between speed and velocity
- The difference between constant and changing motion
- Objects in free fall will have an acceleration of g

Students will be skilled at…

- Drawing vector diagrams to scale
- Designing a procedure to collect data about objects in motion
- Interpret graphs of motion and make predictions about what might be happening to an object
- Using appropriate kinematics equations based on what information is known and unknown.

Unit 3: Projectile Motion

Timeline: 3 Weeks - 1st 9 Weeks

Unit Summary: Students will expand their previous knowledge of motion by exploring objects moving both horizontally and vertically at the same time.

Transfer Goal: Recognize how motion changes for objects traveling in two dimensions on earth.

Students will know…

- How to calculate the horizontal speed, distance or time of an object launched horizontally in the air.
- How to calculate the vertical height of an object launched horizontally in the air.
- How to calculate the vertical speed of an object launched horizontally after as it hits the ground.
- How to calculate the horizontal speed, distance or time of an object launched into the air from the ground.
- How to calculate the vertical height of an object launched into the air from the ground.
- How to calculate the vertical speed of an object launched into the air from the ground.
- For objects launched into the air, as it rises it will slow down at the same rate it speeds up as it falls.
- The time an object travels horizontally is time it takes to fall when launched horizontally.
- The time object travels horizontally is the same time it takes an object to rise and fall when launched into the air from the ground.
- Resolve the actual initial, vertical initial, and horizontal initial velocity using trig functions.

Students will be skilled at…

- Predicting where an object will land when launched horizontally
- Designing a proper procedure regarding an object moving in two dimensions, to collect data for unknown variables or make it possible to calculate them
- Use the calculator as a tool in situations where trigonometry is needed.

Unit 4: Forces and Newton's Laws

Timeline: 3 Weeks - 2nd 9 weeks

Unit Summary: Students will explore the forces that cause motion as well as the laws that govern these forces and the resulting motion of objects.

Transfer Goal: Recognize whether or not an object is in static equilibrium and how it will behave as a result

Students will know…

- If net force is ZERO an object is in static equilibrium

- How to calculate net force
- A free body diagram can be used to model forces acting on an object
- The relationship between mass, inertia, weight
- How net force determines motion
- Net force is directly related to an acceleration of an object
- Mass and acceleration are inversely related to each other
- The unit of force is the Newton

Students will be skilled at…

- Modeling forces in physical situations
- Prove that an actual object is in static equilibrium
- Show the relationships between force, mass, and acceleration using objects in the laboratory
- Solving problems with unknown information using appropriate formulas

Unit 5: Types of Forces

Timeline: 3 Weeks - 2nd 9 Weeks

Unit Summary: Students will increase the depth of their knowledge about specific natural forces that are always present between objects or in certain situations.

Transfer Goal: Recognize the many external forces that affect the motion of objects on Earth.

Students will know…

- Friction works in the opposite direction of motion
- Friction depends on surfaces in contact, weight/normal force, and if there is motion
- Static friction force is greater than kinetic friction force
- Inclines cause an imbalance between the normal force and weight
- Tension in string/rope/cable will oppose applied forces and weight
- Objects in circular motion experience centripetal force and acceleration toward the center of the circular path
- Newton's Universal Law of Gravitation determines the force of attraction between two objects

Students will be skilled at…

- Recognizing the role friction plays in efficiency and strategize ways to reduce friction/improve efficiency
- Applying the advantages of inclines to real situations
- Predicting how an object moving in a circular path is limited by other variables such as friction or speed
- Recognizing the force of gravity between objects determines their relative motions

Unit 6: Work, Power, and Energy

Timeline: 3.5 Weeks - 3rd 9 Weeks

Unit Summary: Students will explore how distance and time of movement determines the work done to an object as well as the power developed. Also, students will connect the work done to an object to the change in its energy, and explore the key forms of energy.

Transfer Goal: Predict how energy changes forms based on based position or movement.

Students will know…

- Objects have energy based on position (PE)
- Objects have energy based on movement (KE)
- Objects with more inertia have more energy
- When a force applied to an object and the object moves a distance work is done
- Power is a measure of the speed at which work is done
- Total energy of a system does not change.
- Laws of thermodynamics determine how thermal energy transfers between atoms and from the system to the surroundings
- Thermal energy can be transferred via conduction, convection, and radiation

Students will be skilled at…

- Design an experiment to measure the variables to calculate work and power.
- Collect information to show the energy of an object.
- Show how the energy of an object in a system is conserved.

Unit 7: Momentum and Impulse

Timeline: 3 Weeks - 3rd 9 Weeks

Unit Summary: Students will connect the concepts of force and time to the change in speed of an object as well as explore how momentum determines the results of collisions between objects.

Transfer Goal: Predict how an object will change its motion after an interaction with another object based on the momentum of the objects beforehand.

Students will know…

- Moving objects have momentum which is a vector quantity
- Objects with more inertia will have more momentum
- Objects with more velocity will have more momentum
- The momentum of object will change if force is placed upon that object over time...this is known as an Impulse.
- Momentum of a system is conserved when objects interact.

Students will be skilled at…

- Predict the momentum of an object based on its inertia
- Determine the momentum of an object based on its velocity
- Calculate the change in momentum of an object based on the force applied to it for a duration of time.
- Predict the outcome from the interaction of two objects based on their momentum before or after an interaction.

Unit 8: Electricity

Timeline: 4 Weeks - 3rd 9 Weeks

Unit Summary: Students explore the concepts of charges, forces between charges, what happens when charges move, and how circuits can be built so that charges do work.

Transfer Goal: Understand that ALL electronic devices rely on charges flowing in a circuit through specialized components.

Students will know…

- Elementary charges are simply electrons and the surplus or deficit of electrons causes objects to be charged
- Since the numbers of electrons involved with charge are staggering, the Coulomb is used as a set quantity for describing charge.
- Charged objects exert force on each other that varies directly with quantity of charge and inversely with separation of the objects
- The tendency of electrons to seek the ground can cause potential difference and the electrons have the ability to do work to reach the ground
- When electrons move, electric current is created which varies directly with the potential difference and inversely with any resistance… this is known as Ohm's Law

Students will be skilled at…

- Predicting where electrons are in surplus or deficit and what the resulting charge on an object will be
- Predicting how charged objects will interact
- Building a functional circuit such that the charges will flow and do work
- Representing an actual circuit as a schematic diagram
- Analyzing circuit diagrams to predict unknown variables
- Choosing and properly connecting appropriate devices to measure unknown quantities in a circuit
- Manipulating circuit components based on desired functionality

Unit 9: Waves

Timeline: 4 Weeks - 4th 9 Weeks

Unit Summary: Students will explore the how energy can be transferred from a source via waves as well as explore the many different characteristics of waves and the interactions between them.

Transfer Goal: Recognize energy transfer naturally occurs mostly due to wave motion.

Students will know…

- Matter can vibrate and cause wavelike motion
- Waves transfer energy through matter and NOT mass.
- Wave motion that is parallel to the source of vibration is longitudinal
- Wave motion that is perpendicular to the source of vibration is transverse
- Some waves require a physical medium and are mechanical while some waves do NOT require a physical medium and are electromagnetic
- Waves have distinct parts
- Wave frequency and wavelength are related indirectly.

- Wave speed in the same medium is equal, regardless of frequency etc.

Students will be skilled at…

- Using springs as a model to create different types of waves with different characteristics
- Predicting wave interference patterns, diffraction patterns, and changes in frequency due to motion of a wave source
- Constructing ray diagrams to observe and predict the behavior of light waves
- Manipulating a wave source to change various wave characteristics and measuring the results
- Calculating the effects on wave speed, frequency(no change), wavelength, and period due to changing medium

Unit 10: Modern Physics

Timeline: 2 Weeks - 4th 9 Weeks

Unit Summary: Students will discover that energy is required to overcome the forces holding electrons in their orbits as well as the forces holding the nuclei of atoms together.

Transfer Goal: Energy is stored in atoms due to the various forces between subatomic particles.

Students will know…

- Atoms are made of protons, neutrons, and electrons, but, those subatomic particles are composed of quarks
- Electrons can be excited or removed from atoms if they are hit by particles with a certain amounts of energy
- Based on the structure of an atom, it will emit light when electrons change from a high energy state to a lower energy state
- Mass can be converted to energy by overcoming the strong nuclear forces in atoms (relativity)
- Nuclear and electromagnetic energy have many applications, but can produce negative side effects

Students will be skilled at…

- Evaluating the benefits and disadvantages of nuclear/electromagnetic energy
- Identifying different gases based on their emission spectra