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**PROGRAM CONCENTRATION:** Government & Public Safety  
**CAREER PATHWAY:** JROTC – Navy  
**COURSE TITLE:** Naval Science II Nautical Science

**Course Description:** The purpose of this course is to introduce the various nautical sciences through classroom work and some laboratory time. The development of core skills that students should master is integrated throughout the course and includes geography, oceanography, astronomy, physical science, meteorology, and weather. Minimum performance requirements of this course are in accordance with current Chief of Naval Education Training Instruction, NAVEDTRA 37128. The performance standards in this course are based on the performance standards identified in the curriculum for the United States Navy Junior Reserve Officer Training Corps. Successful completion of three courses of credit will qualify the student for advanced placement in a college ROTC program or accelerated promotion in the military service.

**MARITIME GEOGRAPHY of the EASTERN and WESTERN SEAS**

**PS- NSIINS-1: Students will demonstrate an understanding of maritime geography as it relates to our national resources, land forms, climate, soil, bodies of water, people, governments, military, and geopolitics.**

- a. Cite three important reasons for the study of geography.
- b. Describe the subdivisions of the World Ocean.
- c. State the importance of geography in military planning and operations.
- d. Describe the Atlantic Ocean, Arctic Ocean, and Mediterranean Sea in terms of their economic and strategic importance to the United States and its allies.
- e. Explain the importance of the Caribbean Sea and Gulf of Mexico to the United States.

**Academic Standard(s): SSWG1 The student will explain the physical aspects of geography.**

- a. Describe the concept of place by explaining how physical characteristics such as landforms, bodies of water, climate, soils, natural vegetation, and animal life are used to describe a place.
- b. Explain how human characteristics including population settlement patterns and human activities such as agriculture and industry can describe a place.
- c. Analyze the interrelationship between physical and human characteristics of a place.

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**SSWG2 The student will explain the cultural aspects of geography**

- a. Describe the concept of place by explaining how the culture of a region is product of the regions physical characteristics.
- b. Explain how cultural characteristics of a place can be used to describe a place.
- c. Analyze how physical factors such as mountains, climate, and bodies of water interact with the people of a region to produce a distinctive culture.
- d. Explain the how the development of customs and traditions help to define a culture and a people.

**SSWG6 The student will describe the interaction of physical and human systems that have shaped contemporary Europe.**

- a. Describe the location of major physical features and their impact on Europe.
- b. Describe the major climates of Europe and how they have affected Europe.
- c. Analyze the importance of Europe's coastal location, climatic characteristics, and river systems regarding population, economic development, and world influence.
- d. Describe the various ethnic and religious groups in Europe and the influence of geography on those groups and their major customs and traditions.
- e. Explain why Europe has a highly integrated network of highways, waterways, railroads, and airline linkages.
- f. Analyze the impact of geography on Russia in terms of population distribution, trade, and involvement in European affairs.
- g. Analyze the environmental issues associated with industrial and natural resource development in Europe including Russia.

**SSWG8 The student will describe the interaction of physical and human systems that have shaped contemporary Canada and the United States.**

- a. Describe the location of major physical features and their impact on the Canada and the United States.
- b. Describe the major climates of Canada and the United States and how they affect Canada and the United States.
- c. Explain the reasons for the population distribution in Canada and the United States.
- d. Explain how the physical geography of Canada and the United States contributed to regional growth and development.
- e. Describe the ethnic and religious groups in Canada and the United States including major customs and traditions.
- f. Analyze how transportation and communications improvements led to the growth of industry in the United States and the consequences of such growth especially environmentally for both Canada and the United States.

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**PS- NSIINS -2: Students will demonstrate an understanding of maritime geography as it relates to our national resources, land forms, climate, soil, bodies of water, people, governments, military, and geopolitics.**

- a. Cite the importance of the Red Sea and the Gulf of Aden to American interests.
- b. Explain the role of the United States and its allies in the Persian Gulf and the Gulf of Oman.
- c. Describe the Indian Ocean in terms of its economic and strategic value to the United States and its allies.
- d. Describe the value of the Pacific Ocean to the United States and its allies.
- e. Show the special features of the Antarctic Ocean.

**Academic Standard(s): SSWG1 The student will explain the physical aspects of geography.**

- a. Describe the concept of place by explaining how physical characteristics such as landforms, bodies of water, climate, soils, natural vegetation, and animal life are used to describe a place.
- b. Explain how human characteristics including population settlement patterns and human activities such as agriculture and industry can describe a place.
- c. Analyze the interrelationship between physical and human characteristics of a place.

**SSWG2 The student will explain the cultural aspects of geography**

- a. Describe the concept of place by explaining how the culture of a region is product of the regions physical characteristics.
- b. Explain how cultural characteristics of a place can be used to describe a place.
- c. Analyze how physical factors such as mountains, climate, and bodies of water interact with the people of a region to produce a distinctive culture.

## **OCEANOGRAPHY**

**PS- NSIINS -3: Students will have an understanding of the significance of oceanographic study.**

- a. Describe the significance of oceanographic study.
- b. Explain four reasons for the great interests now being shown in the world's oceans.
- c. Imagine those historical events that created great bodies of water.
- d. State the continental drift theory.
- e. Cite those great geological phenomena that occur today as a result of our changing Earth.

**Academic Standard(s): SCSH7 Students will analyze how scientific knowledge is developed. Students will recognize that:**

- a. The universe is a vast single system in which the basic principles are the same everywhere.
- b. Universal principles are discovered through observation and experimental verification.

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- c. From time to time, major shifts occur in the scientific view of how the world works. More often, however, the changes that take place in the body of scientific knowledge are small modifications of prior knowledge. Major shifts in scientific views typically occur after the observation of a new phenomenon or an insightful interpretation of existing data by an individual or research group.
- d. Hypotheses often cause scientists to develop new experiments that produce additional data.
- e. Testing, revising, and occasionally rejecting new and old theories never ends.

**SES3 Students will explore the actions of water, wind, ice, and gravity that create landforms and systems of landforms (landscapes).**

- a. Describe how surface water and groundwater act as the major agents of physical and chemical weathering.
- b. Explain how soil results from weathering and biological processes acting on parent rock.
- c. Describe the processes and hazards associated with both sudden and gradual mass wasting.
- d. Relate the past and present actions of ice, wind, and water to landform distribution and landscape evolution.
- e. Explain the processes that transport and deposit material in terrestrial and marine sedimentary basins, which result, over time, in sedimentary rock.

**SES6 Students will explain how life on Earth responds to and shapes Earth systems.**

- a. Relate the nature and distribution of life on Earth, including humans, to the chemistry and availability of water.
- b. Relate the distribution of biomes (terrestrial, freshwater, and marine) to climate regions through time.
- c. Explain how geological and ecological processes interact through time to cycle matter and energy, and how human activity alters the rates of these processes (e.g., fossil fuel formation and combustion).
- d. Describe how fossils provide a record of shared ancestry, evolution, and extinction that is best explained by the mechanism of natural selection.
- e. Identify the evolutionary innovations that most profoundly shaped Earth systems: photosynthetic prokaryotes and the atmosphere; multicellular animals and marine environments; land plants and terrestrial environments.

**PS- NSIINS -4: Students will have an understanding of the significance of undersea landscapes.**

- a. Explain methods used to explore the ocean floor.
- b. Describe the benefits of the continental shelf.
- c. Discuss the makeup of the continental slope.
- d. Derive the features of the deep ocean basin.
- e. State the sediments found on the ocean floor.

**Academic Standard(s): SES1 Students will investigate the composition and formation of**

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**Earth systems, including the Earth's relationship to the solar system.**

- a. Describe the early evolution of the Earth and solar system, including the formation of Earth's solid layers (core, mantle, and crust), the distribution of major elements, the origin of internal heat sources, and the mechanism by which heat transfer drives plate tectonics.
- b. Explain how the composition of the Earth's crust, mantle and core is determined and compare it to that of other solar system objects.
- c. Describe how the decay of radioactive isotopes is used to determine the age of rocks, Earth, and solar system.
- d. Describe how the Earth acquired its initial oceans and atmosphere.
- e. Identify the transformations and major reservoirs that make up the rock cycle, hydrologic cycle, carbon cycle, and other important geochemical cycles.

**SES5 Students will investigate the interaction of insulation and Earth systems to produce weather and climate.**

- a. Explain how latitudinal variations in solar heating create atmospheric and ocean currents that redistribute heat globally.
- b. Explain the relationship between air masses and the surfaces over which they form.
- c. Relate weather patterns to interactions among ocean currents, air masses, and topography.
- d. Describe how temperature and precipitation produce the pattern of climate regions (classes) on Earth.
- e. Describe the hazards associated with extreme weather events and climate change (e.g., hurricanes, tornadoes, El Niño/La Niña, global warming).

**PS- NSIINS -5: Students will have an understanding of the make up and movement of sea water.**

- a. Describe the chemical makeup and physical properties of water.
- b. State the composition of seawater.
- c. Cite the causes of waves.
- d. Write the causes of beach, coastline erosion, ocean currents, and gyres.
- e. List the effects of tides on coastal areas.
- f. Express the theory of tidal energy.

**Academic Standard(s): SES3 Students will explore the actions of water, wind, ice, and gravity that create landforms and systems of landforms (landscapes).**

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e. Explain the processes that transport and deposit material in terrestrial and marine sedimentary basins, which result, over time, in sedimentary rock.

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b. Relate the distribution of biomes (terrestrial, freshwater, and marine) to climate regions through time.

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e. Identify the evolutionary innovations that most profoundly shaped Earth systems: photosynthetic prokaryotes and the atmosphere; multicellular animals and marine environments; land plants and terrestrial environments.

**PS- NSIINS -6: Students will have an understanding of life in the seas.**

a. Evaluate how microscopic plant life is involved in the ecological system of the oceans.

b. Imagine life-sustaining characteristics of marine life at the edge of the sea.

c. Compare two major divisions of marine animals and their characteristics.

d. Contrast four categories of harmful marine animals that pose a threat to man.

e. Determine the types of equipment used to improve man's capability to penetrate the sea.

f. Create six major groups of pollutants and their effects on marine life.

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**SCSh4 Students will use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.**

- a. Develop and use systematic procedures for recording and organizing information.
- b. Use technology to produce tables and graphs.
- c. Use technology to develop, test, and revise experimental or mathematical models.



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**SCSh7 Students will analyze how scientific knowledge is developed. Students will recognize that:**

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- c. From time to time, major shifts occur in the scientific view of how the world works. More often, however, the changes that take place in the body of scientific knowledge are small modifications of prior knowledge. Major shifts in scientific views typically occur after the observation of a new phenomenon or an insightful interpretation of existing data by an individual or research group.
- d. Hypotheses often cause scientists to develop new experiments that produce additional data.

**METEOROLOGY:**

**PS- NSIINS -7: Students will demonstrate a working knowledge of meteorology and how it affects us.**

- a. Investigate the aspects of the science of weather and the Earth's atmosphere.
- b. Express the significance of weather in history.
- c. Describe the meaning and characteristics of the troposphere, tropopause, stratosphere, ionosphere, and exosphere.
- d. Evaluate the aspects of atmospheric pressure.
- e. Induce the aspects in measuring temperature, relative humidity, and dew point.

**Academic Standard(s): SPS5 Students will compare and contrast the phases of matter as they relate to atomic and molecular motion.**

- a. Compare and contrast the atomic/molecular motion of solids, liquids, gases and plasmas.
- b. Relate temperature, pressure, and volume of gases to the behavior of gases.

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**SES4 Students will understand how rock relationships and fossils are used to reconstruct the Earth's past.**

- a. Describe and apply principles of relative age (superposition, original horizontality, cross-cutting relations, and original lateral continuity) and describe how unconformities form.
- b. Interpret the geologic history of a succession of rocks and unconformities.
- c. Apply the principle of uniformitarianism to relate sedimentary rock associations and their fossils to the environments in which the rocks were deposited.
- d. Explain how sedimentary rock units are correlated within and across regions by a variety of methods (e.g., geologic map relationships, the principle of fossil succession, radiometric dating, and paleomagnetism).
- e. Use geologic maps and stratigraphic relationships to interpret major events in Earth history (e.g., mass extinction, major climatic change, tectonic events).

**SES6 Students will explain how life on Earth responds to and shapes Earth systems.**

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- e. Identify the evolutionary innovations that most profoundly shaped Earth systems: photosynthetic prokaryotes and the atmosphere; multicellular animals and marine environments; land plants and terrestrial environments.

**PS- NSIINS -8: Students will demonstrate understanding of clouds and fog and how it affects us.**

- a. Write the factors associated with cloud formation.

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- b. Draw cloud classifications as they relate to cloud types, altitudes, classes, and overall appearance.
- c. Solve the factors associated when clouds are at sea.
- d. Assess the formation of rain.
- e. Illustrate the process of how fog is formed on the Earth's surface as well as hazards in relation to fog formation.

**Academic Standard(s): S4E3 Students will differentiate between the states of water and how they relate to the water cycle and weather.**

- a. Demonstrate how water changes states from solid (ice) to liquid (water) to gas (water vapor/steam) and changes from gas to liquid to solid.
- b. Identify the temperatures at which water becomes a solid and at which water becomes a gas.
- c. Investigate how clouds are formed.
- d. Explain the water cycle (evaporation, condensation, and precipitation).
- e. Investigate different forms of precipitation and sky conditions (rain, snow, sleet, hail, clouds, and fog).

**PS- NSIINS -9: Students will demonstrate understanding of wind and weather and how it affects us.**

- a. Cite the conditions that cause wind movements.
- b. State effects of the Earth's revolution and inclination movement on our weather patterns.
- c. List the characteristics of low-pressure and high-pressure areas.
- d. Compare the types of monsoons in Southeast Asia.
- e. Evaluate the Beaufort scale and how it is used.

**Academic Standard(s): S4E4 Students will analyze weather charts/maps and collect weather data to predict weather events and infer patterns and seasonal changes.**

- a. Identify weather instruments and explain how each is used in gathering weather data and making forecasts (thermometer, rain gauge, barometer, wind vane, anemometer).
- b. Using a weather map, identify the fronts, temperature, and precipitation and use the information to interpret the weather conditions.
- c. Use observations and records of weather conditions to predict weather patterns throughout the year.
- d. Differentiate between weather and climate.

**S6E4 Students will understand how the distribution of land and oceans affects climate and weather.**

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- a. Demonstrate that land and water absorb and lose heat at different rates and explain the resulting effects on weather patterns.
- b. Relate unequal heating of land and water surfaces to form large global wind systems and weather events such as tornados and thunderstorms.
- c. Relate how moisture evaporating from the oceans affects the weather patterns and the weather events such as hurricanes.

**PS- NSIINS -10: Students will demonstrate understanding of fronts and storms and how it affects us.**

- a. Imagine the development of weather fronts.
- b. Draw the primary frontal zones: Inter-tropical Convergence Zone, Arctic Frontal Zone, and Polar Frontal Zone.
- c. Express the characteristics of cold, warm, and occluded fronts.
- d. Determine the formations, characteristics, and developmental stages of a thunderstorm, hurricane, and tornado.
- e. Justify the purpose and function of Storm Warning Signals and Hurricane Warning System.

**Academic Standard(s): S4E4 Students will analyze weather charts/maps and collect weather data to predict weather events and infer patterns and seasonal changes.**

- a. Identify weather instruments and explain how each is used in gathering weather data and making forecasts (thermometer, rain gauge, barometer, wind vane, anemometer).
- b. Using a weather map, identify the fronts, temperature, and precipitation and use the information to interpret the weather conditions.
- c. Use observations and records of weather conditions to predict weather patterns throughout the year.
- d. Differentiate between weather and climate.

**S1E1 Students will observe, measure, and communicate weather data to see patterns in weather and climate.**

- a. Identify different types of weather and the characteristics of each type.
- b. Investigate weather by observing, measuring with simple weather instruments (thermometer, wind vane, rain gauge), and recording weather data (temperature, precipitation, sky conditions, and weather events) in a periodic journal or on a calendar seasonally.
- c. Correlate weather data (temperature, precipitation, sky conditions, and weather events) to seasonal changes.

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**S6E4 Students will understand how the distribution of land and oceans affects climate and weather.**

- a. Demonstrate that land and water absorb and lose heat at different rates and explain the resulting effects on weather patterns.
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- c. Relate how moisture evaporating from the oceans affects the weather patterns and the weather events such as hurricanes.

**PS- NSIINS -11: Students will demonstrate a working knowledge of weather forecasting and how it affects us.**

- a. State the function and structure of the National Weather Service.
- b. Express the function of the Navy Weather Service.
- c. Translate the purpose of weather satellites.

**Academic Standard(s): S4E4 Students will analyze weather charts/maps and collect weather data to predict weather events and infer patterns and seasonal changes.**

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- b. Using a weather map, identify the fronts, temperature, and precipitation and use the information to interpret the weather conditions.
- c. Use observations and records of weather conditions to predict weather patterns throughout the year.
- d. Differentiate between weather and climate.

**ASTRONOMY**

**PS- NSIINS -12: Students will demonstrate an understanding of astronomy and how it pertains to our solar system and its related bodies: Moon, Sun, stars and planets.**

- a. State the theories of the creation of the universe.
- b. List the methods for astronomical observation.
- c. Describe the methods for using the telescope.
- d. Identify the methods for using the spectrum and balloon observatories.
- e. Show examples of satellites and other exploratory spacecraft.
- f. Explain the efforts in exploring the Solar System.
- g. Predict important events in the field of astronomy and space exploration in the next 20 years.

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**Academic Standard(s): S6E1 Students will explore current scientific views of the universe and how those views evolved.**

- a. Relate the Nature of Science to the progression of basic historical scientific theories (geocentric and heliocentric) as they describe our solar system, and the Big Bang as it describes the formation
- b. Describe the position of the solar system in the Milky Way galaxy and the universe.
- c. Compare and contrast the planets in terms of
  - Size relative to the earth
  - Surface and atmospheric features
  - Relative distance from the sun
  - Ability to support life
- d. Explain the motion of objects in the day/night sky in terms of relative position.
- e. Explain that gravity is the force that governs the motion in the solar system.
- f. Describe the characteristics of comets, asteroids, and meteors.

**SES1 Students will investigate the composition and formation of Earth systems, including the Earth's relationship to the solar system.**

- a. Describe the early evolution of the Earth and solar system, including the formation of Earth's solid layers (core, mantle, and crust), the distribution of major elements, the origin of internal heat sources, and the mechanism by which heat transfer drives plate tectonics.
- b. Explain how the composition of the Earth's crust, mantle and core is determined and compare it to that of other solar system objects.
- c. Describe how the decay of radioactive isotopes is used to determine the age of rocks, Earth, and solar system.
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- c. From time to time, major shifts occur in the scientific view of how the world works. More often, however, the changes that take place in the body of scientific knowledge are small modifications of prior knowledge. Major shifts in scientific views typically occur after the observation of a new phenomenon or an insightful interpretation of existing data by an individual or research group.
- d. Hypotheses often cause scientists to develop new experiments that produce additional data.
- e. Testing, revising, and occasionally rejecting new and old theories never ends.

**S4E2 Students will model the position and motion of the earth in the solar system and will explain the role of relative position and motion in determining sequence of the phases of the moon.**

- a. Explain the day/night cycle of the earth using a model.
- b. Explain the sequence of the phases of the moon.
- c. Demonstrate the revolution of the earth around the sun and the earth's tilt to explain the seasonal changes.
- d. Demonstrate the relative size and order from the sun of the planets in the solar system.

**PS- NSIINS -13: Students will demonstrate an understanding of the moon and how it pertains to our solar system and its related bodies: Sun, stars and planets.**

- a. Solve basic facts about the moon such as size, distance from Earth, and atmosphere.
- b. Express the surface features and geological structure of the Moon.
- c. Explain those theories that describe Moon craters and their formations.
- d. Describe the mountain ranges and riles on the surface of the Moon.
- e. Prove the effect moonquakes have on the Moon.
- f. Cite the basic reasons for Moon exploration.

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- e. Identify the transformations and major reservoirs that make up the rock cycle, hydrologic cycle, carbon cycle, and other important geochemical cycles.

**S6E2 Students will understand the effects of the relative positions of the earth, moon and sun.**

- a. Demonstrate the phases of the moon by showing the alignment of the earth, moon, and sun.

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- b. Explain the alignment of the earth, moon, and sun during solar and lunar eclipses.
- c. Relate the tilt of the earth to the distribution of sunlight throughout the year and its effect on climate.

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- b. Explain the sequence of the phases of the moon.
- c. Demonstrate the revolution of the earth around the sun and the earth's tilt to explain the seasonal changes.
- d. Demonstrate the relative size and order from the sun of the planets in the solar system.

**PS- NSIINS -14: Students will demonstrate an understanding of the sun and how it pertains to our solar system and its related bodies: Moon, stars and planets.**

- a. State basic facts about the Sun, and its relationship to the Earth.
- b. Describe the composition of the Sun.
- c. Explain sunspots and the effects they have on the Earth's atmosphere.
- d. Illustrate the effects the Sun has on the Earth's magnetic field.
- e. Test the effects the Sun's energy has on the Earth.
- f. Discuss the importance of developing solar energy systems.

**Academic Standard(s):**

**S2E2 Students will investigate the position of sun and moon to show patterns throughout the year.**

- a. Investigate the position of the sun in relation to a fixed object on earth at various times of the day.
- b. Determine how the shadows change through the day by making a shadow stick or using a sundial.



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- c. Relate the length of the day and night to the change in seasons (for example: Days are longer than the night in the summer.)
- d. Use observations and charts to record the shape of the moon for a period of time.

**S6E2 Students will understand the effects of the relative positions of the earth, moon and sun.**

- a. Demonstrate the phases of the moon by showing the alignment of the earth, moon, and sun.
- b. Explain the alignment of the earth, moon, and sun during solar and lunar eclipses.
- c. Relate the tilt of the earth to the distribution of sunlight throughout the year and its effect on climate.

**SKE1 Students will describe time patterns (such as day to night and night to day) and objects (such as sun, moon, stars) in the day and night sky.**

- a. Describe changes that occur in the sky during the day, as day turns into night, during the night, and as night turns into day.
- b. Classify objects according to those seen in the day sky and those seen in the night sky.
- c. Recognize that the Sun supplies heat and light to the Earth.

**PS- NSIINS -15: Students will demonstrate an understanding of the planets and how they pertain to our solar system and its related bodies: Moon, Sun, and stars.**

- a. State the solar system in which we live.
- b. Cite the major features and characteristics of the planets Mercury, Mars, Jupiter, Uranus, and Pluto.
- c. Express the special features of Venus as it relates to our solar system.
- d. List the prime features of Saturn and explain how it differs from other planets in our solar system.
- e. Compare the relationship of Neptune and Uranus.

**Academic Standard(s): S4E1 Students will compare and contrast the physical attributes of stars, star patterns, and planets.**

- a. Recognize the physical attributes of stars in the night sky such as number, size, color and patterns.
- b. Compare the similarities and differences of planets to the stars in appearance, position, and number in the night sky.
- c. Explain why the pattern of stars in a constellation stays the same, but a planet can be seen in different locations at different times.
- d. Identify how technology is used to observe distant objects in the sky.

**S4E2 Students will model the position and motion of the earth in the solar system and will explain the role of relative position and motion in determining sequence of the phases of the**

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**moon.**

- a. Explain the day/night cycle of the earth using a model.
- b. Explain the sequence of the phases of the moon.
- c. Demonstrate the revolution of the earth around the sun and the earth's tilt to explain the seasonal changes.
- d. Demonstrate the relative size and order from the sun of the planets in the solar system.

### **ASTEROIDS, COMETS, and METEORS**

**PS- NSIINS -16: Students will demonstrate an understanding of asteroids, comets, and meteors and how they pertain to our solar system and its related bodies: Moon, Sun, stars and planets.**

- a. Identify the asteroid belt as it relates to our solar system.
- b. Describe the composition of comets and their movement.
- c. Contrast the difference between meteoroids, meteors, and meteorites.

**Academic Standard(s): S6E1 Students will explore current scientific views of the universe and how those views evolved.**

- a. Relate the Nature of Science to the progression of basic historical scientific theories (geocentric and heliocentric) as they describe our solar system, and the Big Bang as it describes the formation
- b. Describe the position of the solar system in the Milky Way galaxy and the universe.
- c. Compare and contrast the planets in terms of
  - Size relative to the earth
  - Surface and atmospheric features
  - Relative distance from the sun
  - Ability to support life
- d. Explain the motion of objects in the day/night sky in terms of relative position.
- e. Explain that gravity is the force that governs the motion in the solar system.
- f. Describe the characteristics of comets, asteroids, and meteors.

**PS- NSIINS -17: Students will demonstrate an understanding of the stars and how they pertain to our solar system and its related bodies: Moon, Sun, and planets.**

- a. List the theory adopted as the common unit of astronomical distances.
- b. State the system used to classify stars.
- c. Explain the terms used to identify temporary stars from 134 B.C. to the present.
- d. Write three Nebulae stars and their makeup.

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- e. Determine the characteristics of our galaxy and the three ways other galaxies are classified according to their shape.

**Academic Standard(s): S4E1 Students will compare and contrast the physical attributes of stars, star patterns, and planets.**

- a. Recognize the physical attributes of stars in the night sky such as number, size, color and patterns.
- b. Compare the similarities and differences of planets to the stars in appearance, position, and number in the night sky.
- c. Explain why the pattern of stars in a constellation stays the same, but a planet can be seen in different locations at different times.
- d. Identify how technology is used to observe distant objects in the sky.

### **PHYSICAL SCIENCE**

**PS- NSIINS -18: Students will demonstrate an understanding of Motion, Force, and Aerodynamics.**

- a. Describe the two main topics in the field of physical science.
- b. List the six steps in the scientific method approach.
- c. State the differences in a theory and a law.
- d. Describe Newton's three laws of motion.
- e. Discuss Bernoulli's theorem.

**Academic Standard(s): SPS8 Students will determine relationships among force, mass, and motion.**

- a. Calculate velocity and acceleration.
- b. Apply Newton's three laws to everyday situations by explaining the following:
  - Inertia
  - Relationship between force, mass and acceleration
  - Equal and opposite forces
- c. Relate falling objects to gravitational force
- d. Explain the difference in mass and weight.
- e. Calculate amounts of work and mechanical advantage using simple machines.

**S4P3 Students will demonstrate the relationship between the application of a force and the resulting change in position and motion on an object.**

- a. Identify simple machines and explain their uses (lever, pulley, wedge, inclined plane, screw, wheel and axle).
- b. Using different size objects, observe how force affects speed and motion.

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c. Explain what happens to the speed or direction of an object when a greater force than the initial one is applied.

d. Demonstrate the effect of gravitational force on the motion of an object.

Teacher note: The use of mathematical formulas is not recommended in S4P3. Fourth grade students should carry out investigations to provide a foundation of concrete experience for the abstract understandings of physical science in upper grades.

**S8P3 Students will investigate relationship between force, mass, and the motion of objects.**

a. Determine the relationship between velocity and acceleration.

b. Demonstrate the effect of balanced and unbalanced forces on an object in terms of gravity, inertia, and friction.

c. Demonstrate the effect of simple machines (lever, inclined plane, pulley, wedge, screw, and wheel and axle) on work.

**PS- NSIINS -19: Students will demonstrate an understanding of buoyancy.**

a. Describe Archimedes Law.

b. Explain how objects float. Infer how a submarine floats and submerges.

c. Define stability in a ship and its importance.

**Academic Standard(s): SP1 Students will analyze the relationships between force, mass, gravity, and the motion of objects.**

a. Calculate average velocity, instantaneous velocity, and acceleration in a given frame of reference.

b. Compare and contrast scalar and vector quantities.

c. Compare graphically and algebraically the relationships among position, velocity, acceleration, and time.

d. Measure and calculate the magnitude of frictional forces and Newton's three Laws of Motion.

e. Measure and calculate the magnitude of gravitational forces.

f. Measure and calculate two-dimensional motion (projectile and circular) by using component vectors.

g. Measure and calculate centripetal force.

h. Determine the conditions required to maintain a body in a state of static equilibrium.

**PS- NSIINS -20: Students will demonstrate an understanding of basic electricity.**

a. Define the fundamental theory of electricity.

b. Cite the properties of conductors and insulators.

c. List the six common methods of producing voltage.

d. Test battery construction and significant characteristics.

e. Adapt the principle of electrical circuits.

f. Define Ohm's Law as it relates to current and resistance.

g. Derive the electrical power theory.

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**Academic Standard(s): SPS10 Students will investigate the properties of electricity and magnetism.**

a. Investigate static electricity in terms of

- friction
- induction
- conduction

b. Explain the flow of electrons in terms of

- alternating and direct current.
- the relationship among voltage, resistance and current.
- simple series and parallel circuits.

c. Investigate applications of magnetism and/or its relationship to the movement of electrical charge as it relates to

- electromagnets
- simple motors
- permanent magnets

**PS- NSIINS -21: Students will demonstrate an understanding of electronics.**

- a. Discuss the principles of radio-frequency wave transmission.
- b. Describe the principals of radar.
- c. Illustrate the use of radar as a navigational aid.
- d. Critique the use of radar in combat.

**Academic Standard(s): S8P4 Students will explore the wave nature of sound and electromagnetic radiation.**

- a. Identify the characteristics of electromagnetic and mechanical waves.
- b. Describe how the behavior of light waves is manipulated causing reflection, refraction diffraction, and absorption.
- c. Explain how the human eye sees objects and colors in terms of wavelengths.
- d. Describe how the behavior of waves is affected by medium (such as air, water, solids).
- e. Relate the properties of sound to everyday experiences.

**PS- NSIINS -22: Students will demonstrate an understanding of sound and sonar.**

- a. Explain the effects that density and temperature have on sound.
- b. Describe how the ear detects sound.

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- c. Make sense of Doppler shift.
- d. Investigate the characteristics of sound in seawater.
- e. Assess sonar and its characteristics.

**Academic Standard(s): S4P2 Students will demonstrate how sound is produced by vibrating objects and how sound can be varied by changing the rate of vibration.**

- a. Investigate how sound is produced.
- b. Recognize the conditions that cause pitch to vary.

**S1P1 Students will investigate light and sound.**

- a. Recognize sources of light.
- b. Explain how shadows are made.
- c. Investigate how vibrations produce sound.
- d. Differentiate between various sounds in terms of (pitch) high or low and (volume) loud or soft.
- e. Identify emergency sounds and sounds that help us stay safe

## Reading Across the Curriculum

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### Reading Standard Comment

After the elementary years, students engage in reading for learning. This process sweeps across all disciplinary domains, extending even to the area of personal they experience text in all genres and modes of discourse. In the study of various disciplines of learning (language arts, mathematics, science, social studies), students must learn through reading the communities of discourse of each of those disciplines. Each subject has its own specific vocabulary, and for students to excel in all subjects, they must learn the specific vocabulary of those subject areas in context.

Beginning with the middle grades years, students begin to self-select reading materials based on personal interests established through classroom learning. Students become curious about science, mathematics, history, and literature as they form contexts for those subjects related to their personal and classroom experiences. As students explore academic areas through reading, they develop favorite subjects and become confident in their verbal discourse about those subjects.

Reading across curriculum content develops both academic and personal interests in students. As students read, they develop both content and contextual vocabulary. They also build good habits for reading, researching, and learning. The Reading Across the Curriculum standard focuses on the academic and personal skills students acquire as they read in all areas of learning.

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Students will enhance reading in all curriculum areas by:

- a. Reading in all curriculum areas

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- Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas.
  - Read both informational and fictional texts in a variety of genres and modes of discourse.
  - Read technical texts related to various subject areas.
- b. Discussing books
- Discuss messages and themes from books in all subject areas.
  - Respond to a variety of texts in multiple modes of discourse.
  - Relate messages and themes from one subject area to messages and themes in another area.
  - Evaluate the merit of texts in every subject discipline.
  - Examine author's purpose in writing.
  - Recognize the features of disciplinary texts.
- c. Building vocabulary knowledge
- Demonstrate an understanding of contextual vocabulary in various subjects.
  - Use content vocabulary in writing and speaking.
  - Explore understanding of new words found in subject area texts.
- d. Establishing context
- Explore life experiences related to subject area content.
  - Discuss in both writing and speaking how certain words are subject area related.
  - Determine strategies for finding content and contextual meaning for unknown words.

### **CTAE Foundation Skills**

The Foundation Skills for Career, Technical and Agricultural Education (CTAE) are critical competencies that students pursuing any career pathway should exhibit to be successful. As core standards for all career pathways in all program concentrations, these skills link career, technical and agricultural education to the state's academic performance standards.

The CTAE Foundation Skills are aligned to the foundation of the U. S. Department of Education's 16 Career Clusters. Endorsed by the National Career Technical Education Foundation (NCTEF) and the National Association of State Directors of Career Technical Education Consortium (NASDCTEc), the foundation skills were developed from an analysis of all pathways in the sixteen occupational areas. These standards were identified and validated by a national advisory group of employers, secondary and postsecondary educators, labor associations, and other stakeholders. The Knowledge and Skills provide learners a broad foundation for managing lifelong learning and career transitions in a rapidly changing economy.

**CTAE-FS-1 Technical Skills:** Learners achieve technical content skills necessary to pursue the



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full range of careers for all pathways in the program concentration.

**CTAE-FS-2 Academic Foundations:** Learners achieve state academic standards at or above grade level.

**CTAE-FS-3 Communications:** Learners use various communication skills in expressing and interpreting information.

**CTAE-FS-4 Problem Solving and Critical Thinking:** Learners define and solve problems, and use problem-solving and improvement methods and tools.

**CTAE-FS-5 Information Technology Applications:** Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.

**CTAE-FS-6 Systems:** Learners understand a variety of organizational structures and functions.

**CTAE-FS-7 Safety, Health and Environment:** Learners employ safety, health and environmental management systems in corporations and comprehend their importance to organizational performance and regulatory compliance.

**CTAE-FS-8 Leadership and Teamwork:** Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

**CTAE-FS-9 Ethics and Legal Responsibilities:** Learners commit to work ethics, behavior, and legal responsibilities in the workplace.

**CTAE-FS-10 Career Development:** Learners plan and manage academic-career plans and employment relations.

**CTAE-FS-11 Entrepreneurship:** Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.