

Course Title: Meteorology
Board Approval Date: 06/16/14
Credit / Hours: 0.5 credit

Course Description:

This course provides an introduction to meteorology, the study of the atmosphere, atmospheric phenomena, and the basic principles of weather prediction. Topics include the origin of the atmosphere, composition of the atmosphere, and how atmospheric changes affect weather and climate. Weather and climate are presented from both local and global perspectives. Violent weather disturbances are analyzed. Practical work and theory instruction are provided in reading and constructing weather maps and predicting weather.

Learning Activities / Modes of Assessment:

Large group instruction	Tests and Quizzes
Laboratory experiments	Weather forecasting
Small group work	Mapping
Computer simulations / Video Analysis	
Reading assignments	

Instructional Resources:

Text book: *The Atmosphere* Glencoe Science Lutgens and Tarbuck
Online text resources through Pearson-Prentice-Hall
Videos: Bill Nye the Science Guy, Myth Busters, videos and video clips available through Discovery Ed Streaming, videos and video clips available through Central Columbia S.D. Educational Video Library
Online tutorials and quizzes available online at Quia.com

Course Pacing Guide

Course: **Meteorology**

Course Unit (Topic)	Length of Instruction (Days/Periods)
1. Introduction to Meteorology	05 days
2. The Atmosphere	11 days
3. Solar Radiation	08 days
4. Temperature	16 days
5. Water in the Air and Precipitation	13 days
6. Air Pressure, Wind, and Circulation	15 days
7. Air Masses, Atmospheric Optics, and Storms	<u>18 days</u>
DAYS TOTAL	86 Days

Topic: 01 Introduction to Meteorology

Days: 5

Subject(s):

Grade(s):

Know:

Understand:

Do:

3.3.10.A6.a – Essential
WEATHER AND CLIMATE - Interpret meteorological data to describe and/or predict weather.

Information included in daily weather forecasts

dewpoint, frostpoint, relative humidity, severe weather watch, severe weather warning, warm front, cold front, high pressure center, low pressure center, weather advisory

Information to use in making your own, quick forecast

Beaufort Wind Scale, fair weather, unsettled weather, squall

Terms used to classify and describe clouds

cirrus, cirrocumulus, cirrostratus, altocumulus, altostratus, stratocumulus, stratus, nimbostratus, cumulus, cumulonimbus, alto-, cirro-, cumulo-, nimbo-, strato-

Weather Forecasts
Contain many
Components

3.3.10.A6.a – Essential
WEATHER AND CLIMATE - Interpret meteorological data to describe and/or predict weather.

3.3.12.A7.c – Important
UNIFYING THEMES - PATTERNS Summarize the use of data in understanding seismic events, meteorology, and geologic time.

3.3.10.A6.a - WEATHER AND CLIMATE - Interpret meteorological data to describe and/or predict weather.
3.3.12.A7.c - UNIFYING THEMES - PATTERNS Summarize the use of data in understanding seismic events, meteorology, and geologic time.

Topic: 02 The Atmosphere

Days: 11

Subject(s):

Grade(s):

Know:

Understand:

Do:

3.3.10.A1.d – Important EARTH FEATURES AND THE PROCESSES THAT CHANGE IT -
Explain how the Earth is composed of a number of dynamic, interacting systems exchanging energy or matter.

3.3.10.A3. – Important EARTH'S HISTORY -
Explain how the evolution of Earth has been driven by interactions between the lithosphere, hydrosphere, atmosphere, and biosphere.

3.3.10.A7.a – Important UNIFYING THEMES - SCALE/MODELS
Interpret and create models of the Earth's physical features in various mapping representations.

weather

climate

scientific model

barometer, radiosonde,
rawinsonde,
dropwindsonde, Doppler
radar

aerosol

ozone, troposphere,
tropopause, stratosphere,
stratopause, mesosphere,
mesopause,

Meteorology focuses on events that occur in the atmosphere.

3.3.10.A7.a – Important UNIFYING THEMES - SCALE/MODELS Interpret and create models of the Earth's physical features in various mapping representations.

3.3.10.A1.d - EARTH FEATURES AND THE PROCESSES THAT CHANGE IT - Explain how the Earth is composed of a number of dynamic, interacting systems exchanging energy or matter.

3.3.10.A3. - EARTH'S HISTORY - Explain how the evolution of Earth has been driven by interactions between the lithosphere, hydrosphere, atmosphere, and biosphere.

3.3.10.A7.a - UNIFYING THEMES - SCALE/ MODELS Interpret and create models of the Earth's physical features in various mapping representations.

Topic: 02 The Atmosphere
Subject(s):

Days: 11
Grade(s):

Know:	Understand:	Do:
<div>thermosphere, ionosphere, aurora</div> <div>How people study the atmosphere</div> <div>Components of the atmosphere</div>		

Topic: 03 Solar Radiation

Days: 8

Subject(s):

Grade(s):

Know:

Understand:

Do:

S11.D.2.1.1 – Essential

Describe how changes in concentration of minor components (e.g., O₂, CO₂, ozone, dust, pollution) in Earth's atmosphere are linked to climate change.

S11.D.2.1.2 – Essential

Compare the transmission, reflection, absorption, and radiation of solar energy to and by the Earth's surface under different environmental conditions (e.g., major volcanic eruptions, greenhouse effect, reduction of ozone layer; increased global cloud cover)

3.3.10.A4.b – Compact

SCIENCES AND TRANSFER OF ENERGY - Explain how the Earth's systems and its various cycles are driven by energy.

albedo, heat budget, heat, convection, conduction, radiation, temperature, equinox, solstice, latitude, longitude, why earth has differential heating

Ultraviolet Index, crepuscular rays, greenhouse effect, global climate change, dates of the seasonal changes, aphelion, perihelion

Solar energy from the sun fuels the events that happen in the atmosphere.

S11.D.2.1.1 – Essential

Describe how changes in concentration of minor components (e.g., O₂, CO₂, ozone, dust, pollution) in Earth's atmosphere are linked to climate change.

S11.D.2.1.2 – Essential

Compare the transmission, reflection, absorption, and radiation of solar energy to and by the Earth's surface under different environmental conditions (e.g., major volcanic eruptions, greenhouse effect, reduction of ozone layer; increased global cloud cover)

S11.D.2.1.4 – Essential

Analyze weather maps and weather data (e.g., air masses, fronts, temperature, air pressure, wind speed, wind direction, precipitation) to predict regional or global weather events.

S11.D.2.1.1 - Describe how changes in concentration of minor components (e.g., O₂, CO₂, ozone, dust, pollution) in Earth's atmosphere are linked to climate change.

S11.D.2.1.2 - Compare the transmission, reflection, absorption, and radiation of solar energy to and by the Earth's surface under different environmental conditions (e.g., major volcanic eruptions, greenhouse effect, reduction of ozone layer; increased global cloud cover)

S11.D.2.1.4 - Analyze weather maps and weather data (e.g., air masses, fronts, temperature, air pressure, wind speed, wind direction, precipitation) to predict regional or global weather events.

S11.D.2.1.1 - Describe how changes in concentration of minor components (e.g., O₂, CO₂, ozone, dust, pollution) in Earth's atmosphere are linked to climate change.

S11.D.2.1.2 - Compare the transmission, reflection, absorption, and radiation of solar energy to and by the Earth's surface under different environmental conditions (e.g., major volcanic eruptions,

Topic: 03 Solar Radiation
Subject(s):

Days: 8
Grade(s):

Know:	Understand:	Do:
<p>difference between astronomical seasons and meteorological seasons</p> <p>methods of heat transfer</p> <p>types of light and which types of radiation earth's sun emits</p> <p>distribution of solar energy through the heat budget</p> <p>how sunlight interacts with the atmosphere resulting in phenomena such as colorful skies, greenhouse effect, and climate change</p>		<p>greenhouse effect, reduction of ozone layer;increased global cloud cover)</p> <p>3.3.10.A4.b - SCIENCES AND TRANSFER OF ENERGY - Explain how the Earth's systems and its various cycles are driven by energy.</p>

Topic: 04 Temperature

Days: 16

Subject(s):

Grade(s):

Know:

3.3.10.A6.a – Essential
WEATHER AND CLIMATE - Interpret meteorological data to describe and/or predict weather.

3.3.10.A7.a – Important
UNIFYING THEMES - SCALE/MODELS
Interpret and create models of the Earth's physical features in various mapping representations.

temperature, isotherm,
temperature gradient,
specific heat, leeward,
windward, albedo,
degree-days, wind chill,
heat index, heat wave,
urban heat island

How to convert
temperatures from one
scale to another

Definition of
temperature

Recommendations for
proper placement of
outdoor thermometers

Plotting and reading
isotherms on a weather
map

Understand:

Temperature is more
than just being hot or
cold.

Do:

SI.8-10.2 – Essential

Know that both direct and indirect observations are used by scientists to study the natural world and universe.

3.3.10.A6.a – Essential

WEATHER AND CLIMATE - Interpret meteorological data to describe and/or predict weather.

3.3.10.A7.a – Important

UNIFYING THEMES - SCALE/MODELS Interpret and create models of the Earth's physical features in various mapping representations.

SI.8-10.2 - Know that both direct and indirect observations are used by scientists to study the natural world and universe.

3.3.10.A6.a - WEATHER AND CLIMATE - Interpret meteorological data to describe and/or predict weather.

3.3.10.A7.a - UNIFYING THEMES - SCALE/MODELS Interpret and create models of the Earth's physical features in various mapping representations.

Topic: 04 Temperature
Subject(s):

Days: 16
Grade(s):

Know:	Understand:	Do:
<p>General patterns of temperature change throughout a day</p> <p>How location with respect to proximity to an ocean affects annual temperature range</p>		

Topic: 05 Water in the Air and Precipitation

Days: 13

Subject(s):

Grade(s):

Know:

3.3.10.A4.b – Compact SCIENCES AND TRANSFER OF ENERGY - Explain how the Earth's systems and its various cycles are driven by energy.

3.3.10.A7.b – Compact UNIFYING THEMES - CONSTANCY AND CHANGE Relate constancy and change to the hydrologic and geochemical cycles.

Phase changes of water

How and why precipitation forms

Types of precipitation

endothermic, exothermic, deposition, sublimation, transpiration, orographic lifting, absolute humidity, relative humidity, dew point, frost point, adiabatic temperature change, dry adiabatic rate, lifting condensation level, wet adiabatic rate, collision-coalescence process, Bergeron process, super-cool water, drizzle, rain, sleet, freezing rain, glaze, hail, virga, dendrite, snow

Understand:

Water in the Air goes through Changes of Form

Do:

3.3.10.A5.b – Essential

WATER - Explain the processes of the hydrologic cycle.

3.3.10.A5.b - WATER - Explain the processes of the hydrologic cycle.

3.3.10.A4.b - SCIENCES AND TRANSFER OF ENERGY - Explain how the Earth's systems and its various cycles are driven by energy.

3.3.10.A7.b - UNIFYING THEMES - CONSTANCY AND CHANGE Relate constancy and change to the hydrologic and geochemical cycles. processes of the hydrologic cycle.

3.3.10.A4.b - SCIENCES AND TRANSFER OF ENERGY - Explain how the Earth's systems and its various cycles are driven by energy.

3.3.10.A7.b - UNIFYING THEMES - CONSTANCY AND CHANGE Relate constancy and change to the hydrologic and geochemical cycles.

Topic: 06 Air Pressure, Wind, and Circulation

Days: 15

Subject(s):

Grade(s):

Know:

Understand:

Do:

3.3.10.A6.b – Compact
WEATHER AND CLIMATE - Explain the phenomena that cause global atmospheric processes such as storms, currents, and wind patterns.

3.3.10.A6.a – Essential
WEATHER AND CLIMATE - Interpret meteorological data to describe and/or predict weather.

3.3.12.A1.a – Important
EARTH FEATURES AND THE PROCESSES THAT CHANGE IT - Explain how parts are related to other parts in weather systems, solar systems, and earth systems, including how the output from one part can become an input to another part.

3.3.12.A4.b – Important
SCIENCES AND TRANSFER OF ENERGY - Relate the transfer of energy through radiation, conduction, and convection to global atmospheric processes.

3.3.12.A6.a – Important
WEATHER AND CLIMATE - Explain how the unequal heating of the Earth's surface leads to atmospheric global circulation changes, climate, local short term changes, and weather.

Wind is created by differences in air pressure.

3.3.10.A6.a – Essential
WEATHER AND CLIMATE - Interpret meteorological data to describe and/or predict weather.

3.3.12.A7.c – Important
UNIFYING THEMES - PATTERNS Summarize the use of data in understanding seismic events, meteorology, and geologic time.

3.3.10.A6.a - WEATHER AND CLIMATE - Interpret meteorological data to describe and/or predict weather.

3.3.12.A7.c - UNIFYING THEMES - PATTERNS Summarize the use of data in understanding seismic events, meteorology, and geologic time.

3.3.10.A6.b - WEATHER AND CLIMATE - Explain the phenomena that cause global atmospheric processes such as storms, currents, and wind patterns.

3.3.10.A6.a - WEATHER AND CLIMATE - Interpret meteorological data to describe and/or predict weather.

3.3.12.A1.a - EARTH FEATURES AND THE PROCESSES THAT CHANGE IT - Explain how parts are related to other parts in weather systems, solar systems, and earth systems, including how the output from one part can become an input to another part.

3.3.12.A4.b - SCIENCES AND TRANSFER OF ENERGY - Relate the transfer of energy through radiation, conduction, and convection to global atmospheric processes.

3.3.12.A6.a - WEATHER AND CLIMATE - Explain how the unequal heating of the Earth's surface leads to atmospheric global circulation changes, climate, local short term changes, and weather.

Topic: 06 Air Pressure, Wind, and Circulation

Days: 15

Subject(s):

Grade(s):

Know:	Understand:	Do:
<p>Define air pressure</p> <p>Explain how air pressure is measured and which units are used when measuring pressure</p> <p>Explain how air pressure changes with elevation</p> <p>Describe high and low pressure centers or systems</p> <p>Realize that wind is the attempt to balance air pressures across the surface of the earth</p> <p>Describe the patterns of the global winds</p> <p>Identify the prevailing winds for the local area</p> <p>Understand the influence of the jet stream on local weather patterns and events</p>		<p>3.3.10.A6.b - WEATHER AND CLIMATE - Explain the phenomena that cause global atmospheric processes such as storms, currents, and wind patterns.</p> <p>3.3.10.A6.a - WEATHER AND CLIMATE - Interpret meteorological data to describe and/or predict weather.</p> <p>3.3.12.A1.a - EARTH FEATURES AND THE PROCESSES THAT CHANGE IT - Explain how parts are related to other parts in weather systems, solar systems, and earth systems, including how the output from one part can become an input to another part.</p> <p>3.3.12.A4.b - SCIENCES AND TRANSFER OF ENERGY - Relate the transfer of energy through radiation, conduction, and convection to global atmospheric processes.</p> <p>3.3.12.A6.a - WEATHER AND CLIMATE - Explain how the unequal heating of the Earth's surface leads to atmospheric global circulation changes, climate, local short term changes, and weather.</p>

Topic: 07 Air Masses, Atmospheric Optics, and Storms

Days: 18

Subject(s):

Grade(s):

Know:

Understand:

Do:

3.3.12.A1.a – Important
EARTH FEATURES AND THE PROCESSES THAT CHANGE IT - Explain how parts are related to other parts in weather systems, solar systems, and earth systems, including how the output from one part can become an input to another part.

3.3.10.A4.b – Compact
SCIENCES AND TRANSFER OF ENERGY - Explain how the Earth's systems and its various cycles are driven by energy.

3.3.10.A6.a – Essential
WEATHER AND CLIMATE - Interpret meteorological data to describe and/or predict weather.

3.3.10.A6.b – Compact
WEATHER AND CLIMATE - Explain the phenomena that cause global atmospheric processes such as storms, currents, and wind patterns.

Classifications of air masses

Optical phenomena

Types and formation of storms

Changes in the Weather are Created through the Interactions of Solar Energy, Water, Air, and Earth's Surface

3.3.12.A7.a – Important
UNIFYING THEMES - MODELS Interpret and analyze a combination of ground-based observations, satellite data, and computer models to demonstrate Earth systems and their interconnections.

3.3.12.A7.c – Important
UNIFYING THEMES - PATTERNS Summarize the use of data in understanding seismic events, meteorology, and geologic time.

SI.8-10.5 – Important
Recognize and analyze alternative explanations and models.

SI.8-10.2 – Essential
Know that both direct and indirect observations are used by scientists to study the natural world and universe.

3.3.10.A6.a – Essential
WEATHER AND CLIMATE - Interpret meteorological data to describe and/or predict weather.

3.3.12.A7.a - UNIFYING THEMES - MODELS
Interpret and analyze a combination of ground-based observations, satellite data, and computer models to demonstrate Earth systems and their interconnections.

3.3.12.A7.c - UNIFYING THEMES - PATTERNS
Summarize the use of data in understanding seismic events, meteorology, and geologic time.

SI.8-10.5 - Recognize and analyze alternative explanations and models.

SI.8-10.2 - Know that both direct and indirect observations are used by scientists to study the natural world and universe.

3.3.10.A6.a - WEATHER AND CLIMATE - Interpret meteorological data to describe and/or predict weather.

Topic: 07 Air Masses, Atmospheric Optics, and Storms
Subject(s):

Days: 18
Grade(s):

Know:	Understand:	Do:
		3.3.10.A6.b - WEATHER AND CLIMATE - Explain the phenomena that cause global atmospheric processes such as storms, currents, and wind patterns.