Modesto Junior College

Course Outline of Record Report

10/18/2022

METEO161 : Introduction to Meteorology

General Information

Faculty Author:	• Noah Hughes
Attachments:	METEO-161_SU18.pdf METEO 161.pdf METEO 161 eml strng CID GEOG 130.pdf C-ID template_200.pdf ASSIST CAS METEO 161.pdf
Course Code (CB01) :	METEO161
Course Title (CB02) :	Introduction to Meteorology
Department:	Earth Science
Proposal Start Date:	MJC Summer 2020
TOP Code (CB03) :	(1999.00) Other Physical Sciences
CIP Code:	(40.9999) Physical Sciences, Other
SAM Code (CB09) :	Non-Occupational
Distance Education Approved:	No
Is Distance Education Course:	No
Course Control Number (CB00) :	CCC000451944
Curriculum Committee Approval Date:	02/14/2017
Board of Trustees Approval Date:	03/08/2017
External Review Approval Date:	09/01/2015
Course Description:	Introduction to atmospheric structure, weather monitoring techniques, solar radiation, thermodynamics, air pressure, humidity, cloud formation, wind patterns, planetary circulation patterns, storms and severe weather (including thunderstorms, tornadoes, and hurricanes), and the causes and consequences of climate and climate change. Lab activities emphasize gathering and analysis of meteorological data (both archived and real-time) to understand and predict weather events. (C-ID GEOG 130)
Proposal Type:	Course is being updated for periodic review. No value
Faculty Author:	No value

Discipline(s)

Master Discipline Preferred:	• Earth Science
Bachelors or Associates Discipline Preferred:	No value

Course Coding

Basic Skill Status (CB08)

Course is not a basic skills course.

☐ Allow Students to Gain Credit by Exam/Challenge

Rationale For Credit By Exam/Challenge

No value

Course Support Course Status (CB26)

Course is not a support course

Course Special Class Status (CB13)

Course is not a special class.

Repeatability

0

Type of Repeat

No value

Grading

- A-F or P/NP

Course Prior To College Level (CB21)

Not applicable.

☐ Allow Students To Audit Course

Associated Programs

☑ Course is part of a program (CB24)

Associated Program	Award Type	Active
IGETC Pattern	Certificate of Achievement	MJC Summer 2021 to MJC Summer 2022
MJC-GE Pattern	MJC-GE Pattern	MJC Summer 2020 to MJC Summer 2021
CSU General Education Pattern	Certificate of Achievement	MJC Summer 2021 to MJC Summer 2022
CSU General Education Pattern	Certificate of Achievement	MJC Summer 2020 to MJC Summer 2021
IGETC Pattern	Certificate of Achievement	MJC Summer 2020 to MJC Summer 2021
MJC-GE Pattern	MJC-GE Pattern	MJC Summer 2021
CSU General Education Pattern	Certificate of Achievement	MJC Summer 2022
IGETC Pattern	Certificate of Achievement	MJC Summer 2022
General Studies: Emphasis in Natural Sciences	A.A. Degree	MJC Summer 2020

Transferability & Gen. Ed. Options

Course General Education Status (CB25)

Y

Transferability (CB05)	Transferability Status
Transferable to both UC and CSU	Approved

MJC General Education (MJC-GE)	Categories	Status	Approval Date	Rationale (include Comparable Course, C-ID Descriptor, etc. if applicable.
Area A: Natural Sciences	(MJC-GE:A)	Approved	No value	No Rationale (include Comparable Course, C-ID Descriptor, etc. if applicable. defined.

CSU General Education Breadth Pattern (CSU-GE)	Categories	Status	Approval Date	Rationale (include Comparable Course, C-ID Descriptor, etc. if applicable.
Area B1:Physical Sciences	(CSU-GE:B1)	Approved	No value	No Rationale (include Comparable Course, C-ID Descriptor, etc. if applicable. defined.
Area B3: Laboratory Activity	(CSU-GE:B3)	Approved	No value	

Intersegmental General Education Transfer Curriculum (IGETC) (for CSU and UC)	Categories	Status	Approval Date	Rationale (include Comparable Course, C-ID Descriptor, etc. if applicable.
Area 5A: Physical Sciences	(IGETC: 5A)	Approved	No value	No Rationale (include Comparable Course, C-ID Descriptor, etc. if applicable. defined.
Area 5C: Laboratory Activity	(IGETC: 5C)	Approved	No value	

Units and Hours

Summary

Minimum Credit Units (CB07)	4
Maximum Credit Units (CB06)	4
Total Course In-Class (Contact) Hours	108
Total Course Out-of-Class Hours	108
Total Student Learning Hours	216

Credit / Non-Credit Options

Course Credit Status (CB04)	Course Non Credit Category (CB22)	Non-Credit Characteristic
Credit - Degree Applicable	Credit Course.	No Value

Course Classification Code (CB11)

Credit Course.

Funding Agency Category (CB23)

Not Applicable.

Cooperative Work Experience Education Status (CB10)

Variable Credit Course

Weekly Student Hours

	In Class	Out of Class
Lecture Hours	3	6
Laboratory Hours	3	0
Activity Hours	0	0

Course Student Hours

Course Duration (Weeks)	18
Hours per unit divisor	52.5
Course In-Class (Contact) Hours	
Lecture	54
Laboratory	54
Activity	0
Total	108
Course Out-of-Class Hours	
Lecture	108
Laboratory	0
Activity	0
Total	108

Time Commitment Notes for Students

No value

Units and Hours - Weekly Specialty Hours

Activity Name	Type	In Class	Out of Class
No Value	No Value	No Value	No Value

Prerequisites, Corequisites, and Advisories

Advisory

EASCI161 - Earth Science

Advisory

MATH30 - Elementary Algebra for STEM Majors

Or qualification by the MJC placement process.

Requisite Skills

Requisite Skills	Description
Describe the nature of Earth Science.	• EASCI 161 - Describe the nature, methods, and importance of the Earth Sciences, including geologic time, dating methods, and fossils.
Be proficient at mathematical operations, such as multiplication and division, as well as graph interpretation.	• MATH 30 - Simplify arithmetic expressions using the correct order of operations. • MATH 30 - Solve and graph linear inequalities in one variable.

Specifications

Methods of Instruction

Methods of Instruction (Typical)	INSTRUCTIONAL METHODS
MOI	1. Current event article summary/analysis (weekly) 2. Textbook readings (weekly) 3. Question sets (weekly) 4. Pre-lab activity (weekly 5. Study and prepare for lecture exams (three/semester) 6. Study and prepare for lab exams (three/semester)

Assignments (Typical)

Evidence of Workload for Course Units (Quantity)

1. Current event article summary/analysis (weekly)
2. Textbook readings (weekly)
3. Question sets (weekly)
4. Pre-lab activity (weekly)
5. Study and prepare for lecture exams (three/semester)
6. Study and prepare for lab exams (three/semester)

Evidence of Critical Thinking (Quality)

1. Typical Assignment
    1. Find, access, and read a recent meteorology (or climatology) related article, summarize its main points, relate to a subdiscipline of atmospheric science, and examine ways in which the subject of the article could affect your life.
2. Lecture Exam Question
    1. Describe and draw the processes involved in the life cycle of an ordinary thunderstorm.
3. Lab Exam Problem
    1. Calculate the intensity of radiation emitted by an object with a surface temperature of 10 degrees C.

Methods of Evaluation (Typical)	Rationale
FORMATIVE EVALUATION	1. Article Summary/Analysis 2. Lab Activities 3. Midterm Exams 4. Question Sets 5. Lab Midterms

SUMMATIVE EVALUATION	1. Final Exam 2. Final Lab Exam

Equipment

No Value

Textbooks

Author	Title	Publisher	Date	ISBN
Ahrens, C. Donald	Essentials of Meteorology: An Invitation to the Atmosphere (6th Ed.)	Brooks/Cole	2017	1111495475

Other Instructional Materials

No Value

Learning Outcomes and Objectives

Course Objectives

Describe the evolution, composition, and structure of the atmosphere.

Describe the role that radiation plays in the earth-atmosphere system, including how radiation enters and leaves the system, the greenhouse effect, and the cause of seasonal variations in temperature.

Describe the factors that control air temperature on daily, seasonal, and annual time-scales.

Explain the role of water in the earth's atmosphere and the relationship between humidity, condensation, and cloud/fog formation.

Relate atmospheric stability, cloud formation, and precipitation.

Relate air pressure and wind.

Describe and explain various atmospheric circulation patterns across a range of size and time scales.

Explain the formation, development, and processes of middle-latitude cyclones.

Describe and relate the formation of thunderstorms and tornadoes.

Describe the formation, nature, and consequences of hurricanes.

Describe the sources of various types of air pollution and the factors that affect pollution levels.

Relate global patterns of climate to the factors that control climate.

Explain the causes of climate change in the past and present.

Lab Objectives

Identify prominent atmospheric layers and boundaries on a graph of air temperature vs. height.

Identify on a map all U.S. states and Canadian Provinces, as well as major physiographic provinces and geographic features of North America.

Identify major latitude belts on Earth.

Convert temperatures between Celsius, Fahrenheit, and Kelvin scales.

Use Wien's Law to calculate the wavelength of maximum radiation intensity emitted by an object of given temperature.

Use the Stefan-Boltzman law to calculate the intensity of radiation emitted by an object of given temperature.

Distinguish between high and low clouds on infrared satellite imagery.

On a graph of incoming and outgoing radiation vs. time, be able to identify the times of sunrise, sunset, daily high temperature, and daily low temperature.

Use a temperature vs tie graph to identify the daily temperature range and predict the effect of cloud cover on the daily temperature range.

Compare the annual temperature range of various locations and relate them to the geographic factors responsible for any observed differences.

Calculate relative humidity for a given air temperature and vapor pressure.

Determine a "heat index" for a given air temperature and relative humidity.

Determine the relative humidity and dew point temperature for air of a given dry bulb and wet bulb temperature.

Predict the air temperature of rising and sinking parcels of air at various heights in the atmosphere, under adiabatic conditions.

Use a graph of adiabatic lapse rate and environmental lapse rate vs. height to identify condensation level and level of free convection, where applicable.

Use a Stuve diagram (or any graph of adiabatic lapse rate and environmental lapse rate vs height) to assess the stability of the atmosphere with respect for development of severe storms.

Determine the wind speed, wind direction, and air pressure (or pressure height) from a surface station model (or upper level station model).

Use a surface air pressure chart to identify cyclones and anticyclones, predict wind directions around them, and predict relative wind speeds around them.

Use an upper air chart to identify troughs and ridges, predict wind directions around them, predict relative wind speeds around them, and identify regions where cyclogenesis is likely to occur.

Use meteograms and surface pressure charts to distinguish between local-scale and synoptic-scale circulations and to identify types of local-scale circulations.

Use maps of sea surface temperature anomalies to characterize the state of the equatorial Pacific Ocean with respect to the El Nino-Southern Oscillation and predict how this may impact the short-term climate of California.

Use maps of prevailing surface wind patterns to the prominent global wind belts and the pressure belts that define them.

Use surface weather charts to identify mid-latitude cyclones and interpret their stage of development based on the types and locations of fronts associated with them.

Use upper level charts to predict the development and movement of mid-latitude cyclones at the surface.

Use a meteogram to relate changing surface weather conditions to the passage of fronts associated with mid-latitude cyclones.

Use integrated maps of upper level pressure patterns and satellite imagery to identify locations of cyclogenesis.

Use Stuve diagrams (or any graph of adiabatic lapse rate and environmental lapse rate vs height) and surface weather charts to evaluate the potential for thunderstorm development.

Identify thunderstorms and/or squall lines from satellite and radar imagery.

Use Doppler radar imagery to identify possible tornadic supercell thunderstorms, as well as their speed and direction of movement.

Use graphs of hurricane central pressure and maximum sustained wind speeds vs time to determine the relationship between hurricane wind speeds and central pressure, as well as identify times of likely landfall.

Use graphs of coastal water levels vs time to determine the height of storm surge and storm tide associated with a landfalling hurricane.

Use maps of predicted landfall locations to locate the areas of coastline that are likely to experience the largest storm surge from a landfalling hurricane.

Use online resources of climate change data to understand the potential consequences of rapid climate change and develop new questions that could be investigated with those online resources.

Recommended Objectives

Describe how weather forecasts are made.

Explain the causes of various atmospheric optical phenomena.

CSLOs

Describe, and explain the causes and consequences of, the processes that control the movement of water throughout the earth-atmosphere system.
Expected SLO Performance: 0.0

Describe, and explain the causes and consequences of, the processes that control the flow of heat into, within, and out of the earth-atmosphere system.
Expected SLO Performance: 0.0

Describe, and explain the causes and consequences of the processes that control atmospheric circulation at various scales of time and space.

Expected SLO Performance: 0.0

ISLOs GELO	Demonstrate proficiency in NATURAL SCIENCE by doing the following: Explaining how the scientific method is used to solve problems and escribing how scientific discoveries and theories affect human activities
ISLOs Core ISLOs	Students will develop skills that aid in lifelong personal growth and success in the workplace. Students will be able to: Identify and assess individual values, knowledge, skills, and abilities in order to set and achieve lifelong personal, educational, and professional goals. Practice decision-making that builds self-awareness, fosters self-reliance, and nourishes physical, mental, and social health. Apply skills of cooperation, collaboration, negotiation, and group decision-making. Exhibit quality judgment, dependability, and accountability while maintaining flexibility in an ever-changing world.
	Students will develop skills to effectively search for, critically evaluate, and utilize relevant information while demonstrating technological literacy. Students will be able to: Effectively access information and critically evaluate sources of information. Analyze, synthesize and apply information practically and ethically within personal, professional and academic contexts. Identify, utilize and evaluate the value of a variety of technologies relevant to academic and workplace settings.

Describe and explain the factors that affect climate at various scales of time and space.

Expected SLO Performance: 0.0

Content

Course Content

1. The Earth's Atmosphere
    1. evolution
    2. composition
    3. structure
2. Atmospheric Thermodynamics
    1. thermodynamic processes
    2. earth-atmosphere energy balance
    3. seasons
3. Air Temperature
    1. daily temperature variations
    2. controls of air temperature
    3. collecting and using air temperature data
4. Water in the Atmosphere
    1. phase changes of water
    2. saturation, humidity, relative humidity, and dew point
    3. fog and clouds
5. Stability, Clouds, and Precipitation
    1. atmospheric stability
    2. cloud development
    3. precipitation processes and types
6. Air Pressure and Wind
    1. atmospheric pressure and weather charts
    2. wind-generating forces
    3. surface and upper air wind patterns
7. Atmospheric Circulation
    1. scales of atmospheric motion
    2. local and global wind patterns
    3. wind-ocean interactions
8. Middle Latitude Cyclones
    1. air masses and fronts
    2. life cycle of mid latitude cyclones
    3. cyclogenesis and anticyclogenesis
9. Thunderstorms and Tornadoes
    1. formation of ordinary, severe, and supercell thunderstorms
    2. thunderstorm weather and hazards
    3. tornadoes
10. Hurricanes
    1. conditions of formation

    2. stages of development
    3. hurricane weather and hazards
11. Air Pollution
    1. types and sources of air pollution
    2. factors that affect air pollution
12. Climate
    1. climate classification
    2. controls on climate
13. Climate Change
    1. determining past climates
    2. causes of climate change
    3. recent warming

Lab Content

1. Structure of the Atmosphere
2. Weather maps and charts
3. Satellite imagery
4. Incoming and Outgoing Radiation
5. Air Temperature
6. Water in the Atmosphere
    1. vapor pressure, relative humidity, dewpoint
    2. saturation and condensation
7. Atmospheric Stability
    1. clouds on satellite imagery
    2. precipitation of weather radar
8. Air Pressure and Wind
    1. surface charts and surface winds
    2. upper air charts and upper level winds
9. Wind Patterns
    1. global planetary scale wind patterns
    2. local wind patterns
10. Mid-Latitude Cyclone
    1. Cyclone weather
    2. Cyclones on surface charts and satellite imagery
11. Thunderstorms
    1. Satellite/weather radar interpretation
    2. Tornados
12. Hurricanes
    1. Hurricane tracks and landfall
    2. Hurricane development
13. Air Pollution
14. Climate