METRO 10 Course Outline as of Fall 1998

CATALOG INFORMATION

Dept and Nbr: METRO 10 Title: INTRODUCTION
Full Title: Introduction to Meteorology
Last Reviewed: 9/12/2022

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	3.00	Lecture Scheduled	3.00	17.5	Lecture Scheduled	52.50
Minimum	3.00	Lab Scheduled	0	6	Lab Scheduled	0
		Contact DHR	0		Contact DHR	0
		Contact Total	3.00		Contact Total	52.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 105.00 Total Student Learning Hours: 157.50

Title 5 Category:	AA Degree Applicable
Grading:	Grade or P/NP
Repeatability:	00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:	
Formerly:	

Catalog Description:
A descriptive, non-mathematical introduction to the dynamics of the earth's atmosphere. Weather instrumentation and measurement of precipitation, wind speed and direction, relative humidity, air pressure, temperature, and solar radiation. Topics of atmospheric circulation, cyclones and anticyclones, cloud forms and development of precipitation, air masses, weather fronts, and weather forecasting.

Prerequisites/Corequisites:

Recommended Preparation:
Eligibility for ENGL 100 or ESL 100.

Limits on Enrollment:

Schedule of Classes Information:
Description: A descriptive, non-math introduction to the dynamics of the earth's atmosphere. Weather instrumentation & measurement of precipitation, wind speed & direction, relative humidity, air pressure, temperature & solar radiation. Topics of atmospheric circulation, cyclones & anticyclones cloud forms & development of precipitation, air masses, weather fronts

& weather forecasting. (Grade or P/NP)
Prerequisites/Corequisites:
Recommended: Eligibility for ENGL 100 or ESL 100.
Limits on Enrollment:
Transfer Credit: CSU;UC.
Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	**Area**		Effective:	Inactive:
	C	Natural Sciences	Fall 1981	
CSU GE:	**Transfer Area**		Effective:	Inactive:
	B1	Physical Science	Fall 1981	
IGETC:	**Transfer Area**		Effective:	Inactive:
	5A	Physical Sciences	Fall 1981	

CSU Transfer:	Transferable	Effective:	Fall 1981	Inactive:
UC Transfer:	Transferable	Effective:	Fall 1981	Inactive:

CID:

Certificate/Major Applicable:
Both Certificate and Major Applicable

COURSE CONTENT

Outcomes and Objectives:
After completing the course, the student should be able to:
1. list the six elements of weather, and identify the weather instrument used to measure each one;
2. define the observational qualities that allow meteorologists to divide the atmosphere into four vertical layers;
3. assess the impact of each of the three major and the seven minor atmospheric ingredients have upon global precipitation and global temperature;
4. state average sea level temperature pressure in pounds/inches square, inches of mercury, centimeters of mercury, millibars, and Pascals;
5. express the correct value of the solar constant in calories/centimeters
square, and state the two reasons why this "constant" varies;
6. at the latitude of Santa Rosa, calculate the altitude of the noontime sun on the winter solstice, summer solstice, and equinox dates;
7. write a coherent essay that describes the origin of the Antarctic ozone hole, how it was detected, and why it mainly exists in the Southern Hemisphere;
8. state the values of the latent heat of fusion and vaporization of water;
9. define and express the units used to express specific heat, the calorie, and the kilocalorie;
10. define the three mechanisms of heat transfer;

11. discuss how latitude, water, elevation, and land can exert a powerful influence on a city's annual temperature variation.
12. calculate the relative humidity when given a saturation mixing ratio and an observed (actual) mixing ratio;
13. distinguish the subtle difference between lifting condensation level and dew point temperature;
14. correctly define the difference between rain and drizzle, as well as sleet and freezing rain;
15. describe in a short essay how condensation nuclei and freezing nuclei both contribute to the formation of rain;
16. memorize the ten basic cloud forms, and correctly classify them as low, middle, or high;
17. classify fog into five types and remember the one that is common in Santa Rosa during the winter, and the one that is common in Santa Rosa during the day;
18. given the location and time of a rainbow and/or halo observation, correctly state what change in weather should take place in the next twenty four to thirty six hours;
19. describe how passive and active cloud seeding should theoretically work, and how much these two methods typically increase precipitation;
20. use vectors to illustrate how freely moving, non steered bodies veer to the right in the Northern Hemisphere;
21. list the two conditions that produce a geostrophic wind, and where geostrophic winds typically occur in the United States;
22. correctly identify the wind direction at any point around a nearby high pressure or low pressure region;
23. properly state the correlation between latitude and the strength of the coriolis force;
24. correctly identify the locations of the east trade winds, the prevailing westerlies, the polar easterlies, the Inter-Tropical Convergence, and the horse latitudes;
25. correctly draw in the position of the polar jet stream that flows westward through this field of high and low pressure systems;
26. accurately label ridges, troughs, rex blocks, omega blocks, cut-off lows, and zonal flows on a 500 millibar chart;
27. state where the source regions are located for the four principle air masses that affect weather in the original forty eight US States;
28. define lake-effect snow, and list three US cities which frequently experience it;
29. identify the conditions necessary to produce a chinook wind, and where this type of wind occurs in the United States;
30. define how meteorologists calculate the slope of an approaching cold air mass associated with a cold front;
31. list the sequence of clouds observed during the approach of a slow moving cold front and fast moving cold front;
32. locate a "comma shaped" cloud pattern on a satellite photograph and correctly draw in the position of the cold front, warm front, occluded front;
33. state the principle reason why a well developed occluded front marks the end or dissipation of a frontal system;
34. identify the three stages in the life of an air mass thunderstorm, and correctly note which stage is dominated by updrafts, and which stage is

dominated by entrapment of cold air;
35. place the following terms in order from first to last in a lightning discharge: return stroke, charge separation, dart leader, stepped ladders, thunder;
36. define wind shear, and explain it's relationship to microbursts, macrobursts, and airline safety;
37. specifically state the minimum hail diameter and surface wind speed, required for a thunderstorm to be classified as severe;
38. identify the location of the wall cloud, roll cloud, anvil, overshooting top, rear flank downdraft, front flank downdraft, and gust front in a drawing of a supercell;
39. define the difference between a severe thunderstorm watch and severe thunderstorm warning;
40. detail the specific criteria used to classify a tornado in the F0 to F5 Fujita intensity scale;
41. detail the specific criteria used to classify a hurricane in the F1 to F5 Simpson-Saffir intensity scale;
42. state the ideal circumstances necessary for hurricane formation in terms of water temperature, depth of water temperature, winds aloft, season of the year, and latitude;
43. compare and contrast the hurricane damage done by wind, storm surge, inland flooding, and hurricane spawned tornadoes;
44. draw a diagram showing the cross sectional view of a hurricane that reveals the regions of updraft and downdraft, divergence and convergence;
45. Use the "564" line on a 500 mb chart to determine whether the "storm window" is open or closed for any west coast city;
46. ray trace the path of sunlight through a raindrop that forms a rainbow;
47. use the internet to find an ensemble forecast to assess the accuracy of the numerical forecast models;
48. state the values of the lifted index and K index which indicate whether, or whether not a thunderstorm watch should be issued;
49. ray trace the path of sunlight through a cloud ice crystal to reveal how a halo is formed.

Topics and Scope:

I. Introduction to the Atmosphere
   A. Origin of the atmosphere
   B. Ingredients of the atmosphere
   C. Greenhouse effect and global warming
   D. The seven weather elements
   E. Definition of weather and climate
II. Solar Energy
   A. The electromagnetic spectrum
   B. Mechanisms of heat transfer
   C. Seasons in the northern hemisphere
   D. Temperature scales
   E. Earth's energy equilibrium
III. Air Temperature
   A. Compiling air temperature data
   B. Measuring air temperature

C. Temperature variations
D. Specifics of heat
E. Environmental controls of temperature

IV. Humidity, Condensation, and Clouds
A. Relative humidity
B. Dew and frosts
C. Fog
D. Cloud classification and identification
E. Wet and dry adiabatic lapse rates

V. Cloud Development and Precipitation
A. Precipitation formation processes
B. Measuring precipitation
C. Weather radar
D. Precipitation types
E. Atmospheric stability

VI. Air Pressure and Winds
A. Measuring air pressure
B. Forces influencing the wind
C. Winds aloft
D. Surface winds
E. Beaufort wind scale

VII. Atmospheric Circulations
A. Scales of atmospheric motion
B. Global wind patterns (three cell model)
C. El Nino and the southern oscillation
D. Monsoons
E. Local winds

VIII. Air Masses and Fronts
A. Classification of air masses
B. Cold and warm fronts
C. Stationary and occluded fronts
D. Frontogenesis
E. The jet stream

IX. Weather Forecasting
A. Predicting weather from local signs
B. Satellite photo interpretation
C. Forecast models
D. Watches, warnings, and advisories
E. Internet weather resources

X. Thunderstorms and Tornadoes
A. Air mass thunderstorms
B. Supercells and severe thunderstorms
C. Lightning
D. Tornadoes, waterspouts, and dust devils
E. Tornado damage

XI. Hurricanes
A. Tropical precipitation patterns
B. Anatomy of a hurricane
C. Hurricane damage
D. Predicting hurricane storm tracks
E. Hurricanes on other planets

XII. Air Pollution and Atmospheric Optics

A. Primary and secondary pollutants
B. Air pollution weather
C. Acid rain
D. Rainbows and red sunsets
E. Halos, sundogs, and solar pillars

Assignment:

1. Specific reading and study assignments from the textbook (averaging about one chapter per week, roughly twenty to thirty pages).
2. Handout journal articles with study questions (four per semester, with short answer and essay questions to be turned in for a grade).
3. Textbook essay question of the week (a weekly paragraph written for a grade that is taken from the textbook's end of chapter essay question list).

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Written homework, Reading reports	Writing 30 - 40%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Homework problems, Exams	Problem solving 20 - 30%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

None	Skill Demonstrations 0 - 0%

Exams: All forms of formal testing, other than skill performance exams.

Multiple choice, Completion	Exams 30 - 40%

Other: Includes any assessment tools that do not logically fit into the above categories.

None	Other Category 0 - 0%

Representative Textbooks and Materials:
ESSENTIALS OF WEATHER: Moran and Morgan, Prentice Hall, 1995
ESSENTIALS OF METEOROLOGY: C. Donald Ahrens, West Publishing, 1998
THE ATMOSPHERE: 7th Edition, Lutgens and Torbuck, Prentice Hall, 1998