

Course Outline of Record

1. Course Code: PH-017
2.
 - a. Long Course Title: Introduction To Meteorology
 - b. Short Course Title: INTRO METEOROLOGY
3.
 - a. Catalog Course Description:

This course includes the study of the earth's atmosphere, its composition and vertical structure, energy budgets, air pollution and global warming, clouds and precipitation, weather systems and forecasting, severe weather, and atmospheric optics.
 - b. Class Schedule Course Description:

This course includes the study of the earth's atmosphere, its composition and vertical structure, energy budgets, air pollution and global warming, clouds and precipitation, weather systems and forecasting, severe weather, and atmospheric optics.
 - c. Semester Cycle (if applicable): This course is to be offered once per academic year.
 - d. Name of Approved Program(s):
 - ENVIRONMENTAL SCIENCES AS Degree and Transfer Preparation
4. Total Units: 3.00 Total Semester Hrs: 54.00
 Lecture Units: 3 Semester Lecture Hrs: 54.00
 Lab Units: 0 Semester Lab Hrs: 0
 Class Size Maximum: 28 Allow Audit: No
 Repeatability No Repeats Allowed
 Justification 0
5. Prerequisite or Corequisite Courses or Advisories:

Course with requisite(s) and/or advisory is required to complete Content Review Matrix (CCForm1-A)

 Prerequisite: MATH 054
 Advisory: ENG 061
6. Textbooks, Required Reading or Software: *(List in APA or MLA format.)*
 - a. Lutgens, F., E. Tarbuck, D. Tasa (2016). *The Atmosphere: An Introduction to Meteorology* (13th/e). San Francisco Prentice Hall. ISBN: 0321984420
 College Level: Yes
 Flesch-Kincaid reading level: 12.0
7. Entrance Skills: *Before entering the course students must be able:*
 - a. Understand and use the commutative, associative, distributive, identity, and inverse properties of the Real Numbers under the operations of addition and multiplication.
 - MATH 054 - Apply the commutative, associative, distributive, identity, and inverse properties to simplify algebraic expressions involving polynomial, rational and radical expressions - perform arithmetic operations with algebraic expressions using the order of operations.
 - b. Understand the concepts of variables and how variables can be used to represent unknown quantities.
 - MATH 054 - Understand the concepts of variables and how variables can be used to represent an unknown quantity or a range of quantities.
 - c. Use variables to create algebraic expressions that model an application problem.
 - MATH 054 - Use variables to create algebraic expressions that model quantities in an application problem.
 - d. Apply the commutative, associative, distributive, identity, and inverse properties to simplify algebraic expressions - perform arithmetic operations with algebraic expressions using the order of operations.
 - MATH 054 - Apply the commutative, associative, distributive, identity, and inverse properties to simplify algebraic expressions involving polynomial, rational and radical expressions - perform arithmetic operations with algebraic

expressions using the order of operations.

e. Understand and use the properties of integer exponents to simplify algebraic expressions, including expressions involving scientific notation.

- MATH 054 - Use the properties of integer exponents to simplify algebraic expressions, including expressions involving scientific notation.

f. Use variables with the algebraic method to create algebraic equations or inequalities that model an application problem.

- MATH 054 - Employ variables to create algebraic equations or inequalities that model an application problem.

g. Understand and use the addition, subtraction, multiplication, and division properties of equality to solve linear equations.

- MATH 054 - Use properties of equality to solve linear equations in one variable and describe the solution using set notation.

h. Understand square roots and solve square root equations.

- MATH 054 - Interpret square roots and solve square root equations.

i. Understand the Cartesian coordinate system and use it to graph linear equations by plotting points.

- MATH 054 - Convert between the geometric (Cartesian) and algebraic representations of a linear relation in two variables. Make use of point-slope and slope intercept forms.

j. Understand the meaning of the slope of a line and find an equation for a line using general forms including point-slope and slope intercept.

- MATH 054 - Convert between the geometric (Cartesian) and algebraic representations of a linear relation in two variables. Make use of point-slope and slope intercept forms.

k. Understand and use basic formulas from geometry including perimeter, area, and volume.

- MATH 054 - Use basic formulas from geometry to find perimeter, area and volume of basic figures.
- MATH 054 - Use proportionality to discover side lengths of similar triangles.

l. Apply units and unit conversion appropriately to solve application word problems that involve their use.

Dimensional Analysis.

- MATH 054 - Use dimensional analysis appropriately in applications.

m.

Conduct research and evaluate sources for use as evidence in essays on complex topics.

- ENG 061 - Demonstrate the ability to use research skills including library resources such as books, periodicals, electronic databases and online resources such as the internet.

n.

Integrate source material and demonstrate critical awareness in multi-page essays

- ENG 061 - Demonstrate the ability to think critically and express ideas using various patterns of development.

o.

Format essays correctly according to MLA or APA conventions, including in-text references and correct works cited/reference entries.

- ENG 061 - Utilize a handbook to properly cite and document source material in MLA format.

8. Course Content and Scope:

Lecture:

<p>1. Part I.</p> <ul style="list-style-type: none">1. Introduction to weather observations, charts, and systems2. Atmospheric composition and vertical structure3. Energy and energy budgets <p>2. Part II.</p> <ul style="list-style-type: none">1. Air pollution2. Climate and Global warming <p>3. Part III.</p> <ul style="list-style-type: none">1. Humidity2. Clouds

3. Precipitation
4. Part IV.
1. Structure of large mid-latitude weather systems
2. Air masses, fronts, and frontal cyclones.
3. Weather forecasting
5. Part V.
1. General circulation
2. Thunderstorms and Tornadoes
3. Hurricanes
6. Part VI.
1. Light and color in the atmosphere

Lab: (if the "Lab Hours" is greater than zero this is required)

9. Course Student Learning Outcomes:

1. Explain the history of meteorology and its impact on human history.
2. Use various representations including words, graphs, drawings, and equations to describe phenomena associated with the atmosphere.
3. Analyze meteorological patterns and make predictions of future weather.
4. Describe the composition of the atmosphere and the atmospheric energy budget and how both are affected by human activity.
5. Describe the interaction of visible light with the atmosphere.

10. Course Objectives: *Upon completion of this course, students will be able to:*

Part I.

- b. Interpret weather observations on a weather map
- c. Employ a model to explain a variety of daily weather events.
- d. Describe, using words and /or diagrams, a model for conceptualizing matter as an assemblage of atoms and molecules.
- e. Explain the concepts of temperature, pressure, density, and phase change in terms of the molecular model and/or kinetic theory of gases.
- f. Name the five most common gases in the earth's atmosphere and their approximate concentrations.
- g. Explain how ozone is created and destroyed in the atmosphere, the role of humans, in these processes, and some of the consequences of ozone pollution and depletion.
- h. Name five major layers of the atmosphere, their approximate altitudes, and some identifying features of each layer.
- i. Compare and contrast the concepts of energy, heat, and temperature.
- j. Explain why the amount of incoming solar radiation varies with latitude, time of day and time of year.
- k. Explain how an object's reflectivity and specific heat affect the rate at which it may change temperature.
- l. Calculate an energy budget, given values for various energy fluxes.
- m. Explain how radiation is emitted and absorbed by objects of different densities, temperatures, and chemical makeup.

Part II.

- o. Name six major pollutants, some natural and anthropogenic processes that produce them, and hazards they represent to humans and the environment.
- p. List three indoor air pollutants, their sources, and their health risks.
- q. Describe the roles played by winds, atmospheric stability, and topography in the dispersal of air pollutants.
- r. Describe how acid rain forms and the problems it creates.
- s. Utilize energy budget relations to trace the potential of greenhouse gases bringing about global temperature change.
- t. Describe examples of how an enhanced greenhouse effect can lead to changes in other atmospheric variables.
- u. List observational evidence in support of and in opposition to the hypothesis of global warming, pointing out limitations or uncertainties in such evidence
- v. Describe potential impacts of global warming on the earth's geography and on human activities.

Part III.

- x. Define equilibrium and explain how the amount of water vapor at equilibrium varies with temperature.
- y. Compare five different methods used to describe the amount of water vapor in the air and identify the instruments by which

the measurements are made.

z. Describe how humidity varies diurnally, annually, and by location, and discuss its impact on human health.

aa. Identify conditions under which dew and frost occur.

ab. Explain the roles played by atmospheric particles in the formation and growth of cloud particles.

ac. Identify clouds from each of the major cloud groups and describe how they form.

ad. Distinguish between stable and unstable clouds.

ae. Interpret atmospheric soundings to identify stable layers, unstable layers, inversions, and clouds.

af. Apply thermodynamic diagrams to solve a variety of problems in atmospheric thermodynamics.

ag. Describe two processes why which precipitation forms.

ah. Explain how different types of precipitation form.

ai. Explain the theory behind modern cloud seeding/ precipitation formation.

Part IV.

ak. State Newton's three laws of motion and give examples of each.

al. Name the important forces affecting the behavior of the air.

am. Explain the concept of hydrostatic balance.

an. Define geostrophic balance and draw a force diagram to illustrate it.

ao. Explain how temperature patterns determine upper level pressure patterns.

ap. Explain the relationship between fronts and jet streams.

aq. Identify warm and cold air advection in a layer through vertical changes in horizontal wind direction.

ar. Identify different air mass source regions.

as. Classify air masses on weather maps and by their radiosonde soundings.

at. Locate and label fronts according to their type on a weather map.

au. Describe typical weather conditions that accompany different types of air masses and fronts.

av. Sketch and label stages in the Norwegian cyclone model.

aw. Identify examples of divergence and vorticity in wind flow patterns and describe how cyclone development is related to these patterns and other factors.

ax. Describe, compare, and contrast several basic forecasting methods.

ay. Utilize forecasting methods to make forecasts of weather map features and local weather.

az. Describe the information a meteorologist considers before issuing a forecast.

ba. Interpret a computer weather forecast correctly.

Part V.

bc. Provide examples of atmospheric circulations on five different scales of size and time.

bd. Sketch typical flow patterns for several meteorological phenomena, e.g., land and sea breezes, lee waves, Hadley circulation, etc., and describe the factors and forces important in their formation.

be. Describe the ENSO cycle, including El Nino and La Nina events.

bf. Describe the interaction of the different scales of atmospheric circulation.

bg. Define what is meant by chaos and the "butterfly effect."

bh. Sketch the stages in the development of a typical thunderstorm, showing wind flow patterns, temperatures, and precipitation.

bi. Describe two hypotheses that address the formation of electric charge in thunderstorms.

bj. Describe conditions under which tornadoes form.

bk. List safety precautions appropriate for lightning and tornadoes.

bl. Discuss difficulties and successes in forecasting thunderstorms and tornadoes.

bm. Name the conditions required for a hurricane to form.

bn. Locate on a map the regions of frequent hurricane formation and their path.

bo. Sketch a cross section of a hurricane, indicating all structural components and general patterns of wind flow, air pressure, temperature, clouds, and precipitation.

bp. Identify the energy sources for a hurricane and how it influences growth and decay.

bq. Describe the weather and sea conditions resulting from hurricane's landfall and the associated damage.

br. Identify techniques used in hurricane forecasting, how accurate they are, and the prospects of improving their accuracy.

Part VI.

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- bt. Explain the origin of mirages, sky colors, rainbows and other optical phenomenon.
- bu. Infer something about atmospheric conditions from given optical phenomenon.
- bv. Recognize when and where to look to observe rainbows, halos, and coronas.
- bw. Perform demonstrations that model optical phenomena such as coronas and rainbows.

11. Methods of Instruction: (*Integration: Elements should validate parallel course outline elements*)

a. Lecture

Other Methods:

a. Lectures, presentations, visual aids b. In class demonstrations (hands-on and computer based) c. Videos

12. Assignments: (*List samples of specific activities/assignments students are expected to complete both in and outside of class.*)

In Class Hours: 54.00

Outside Class Hours: 108.00

a. In-class Assignments

1. Attend Lectures and take notes
2. Share information on out-of-class activities
3. Oral Presentation of research project.

b. Out-of-class Assignments

1. Reading assignments (text, online)
2. Problems assigned at the end of each chapter (conceptual and math-based)
3. Online research regarding current weather conditions, IR, UV, and VIS satellite photos, storm tracking, hurricane tracking, etc.
4. Daily weather observations utilizing our new weather station.
5. Research project to be presented to class.

13. Methods of Evaluating Student Progress: *The student will demonstrate proficiency by:*

- Written homework
Assignments at end of chapter.
- Term or research papers
Includes presentation to class.
- Field/physical activity observations
Out of class activity that is to be presented to class as part of the research paper.
- Presentations/student demonstration observations
Research project.
- True/false/multiple choice examinations
- Mid-term and final evaluations

14. Methods of Evaluating: Additional Assessment Information:

a. Periodic examinations on subject matter. These exams will have essay, short answer, problem solving, fills-in, and multiple choice questions. (60%) b. Homework assignments, research project, and online activities. (20%) c. Comprehensive final exam (20%) 90 - 100% A 80 - 89.9% B 65 - 79.9% C 50 - 64.9% D Below 50% F

15. Need/Purpose/Rationale -- *All courses must meet one or more CCC missions.*

IGETC Area 5: Physical and Biological Sciences (mark all that apply)

A: Physical Science without Lab

CSU GE Area B: Physical and its Life Forms(mark all that apply)

B1 - Physical Science

PO-GE C1-Natural Sciences

Explain concepts and theories related to physical, chemical, and biological natural phenomena.

Draw a connection between natural sciences and their own lives.

Use college-level mathematical concepts and methods to understand, analyze, and explain issues in quantitative terms.

IO - Scientific Inquiry

Predict outcomes utilizing scientific inquiry: using evidence and assertions determine which conclusions logically follow from a body of quantitative and qualitative data.

Analyze quantitative and qualitative information to make decisions, judgments, and pose questions.

IO - Critical Thinking and Communication

Apply principles of logic to problem solve and reason with a fair and open mind.

16. Comparable Transfer Course

University System	Campus	Course Number	Course Title	Catalog Year
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17. Special Materials and/or Equipment Required of Students:

18. Materials Fees: Required Material?

Material or Item	Cost Per Unit	Total Cost
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19. Provide Reasons for the Substantial Modifications or New Course:

Change Advisory

- 20. a. Cross-Listed Course (Enter Course Code): *N/A*
- b. Replacement Course (Enter original Course Code): *N/A*

21. Grading Method (choose one): Letter Grade Only

22. MIS Course Data Elements

- a. Course Control Number [CB00]: CCC000461848
- b. T.O.P. Code [CB03]: 190200.00 - Physics, General
- c. Credit Status [CB04]: D - Credit - Degree Applicable
- d. Course Transfer Status [CB05]: A = Transfer to UC, CSU
- e. Basic Skills Status [CB08]: 2N = Not basic skills course
- f. Vocational Status [CB09]: Not Occupational
- g. Course Classification [CB11]: Y - Credit Course
- h. Special Class Status [CB13]: N - Not Special
- i. Course CAN Code [CB14]: *N/A*
- j. Course Prior to College Level [CB21]: Y = Not Applicable
- k. Course Noncredit Category [CB22]: Y - Not Applicable
- l. Funding Agency Category [CB23]: Y = Not Applicable
- m. Program Status [CB24]: 1 = Program Applicable

Name of Approved Program (if program-applicable): ENVIRONMENTAL SCIENCES

Attach listings of Degree and/or Certificate Programs showing this course as a required or a restricted elective.)

23. Enrollment - Estimate Enrollment

First Year: 35
 Third Year: 45

24. Resources - Faculty - Discipline and Other Qualifications:

- a. Sufficient Faculty Resources: Yes
- b. If No, list number of FTE needed to offer this course: *N/A*

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25. Additional Equipment and/or Supplies Needed and Source of Funding.

N/A

26. Additional Construction or Modification of Existing Classroom Space Needed. (*Explain:*)

N/A

27. FOR NEW OR SUBSTANTIALLY MODIFIED COURSES

Library and/or Learning Resources Present in the Collection are Sufficient to Meet the Need of the Students Enrolled in the Course: No

28. Originator Carl Farmer Origination Date 01/30/18