COLLEGE OF THE DESERT

Course Code PH-017L

Course Outline of Record

1. Course Code: PH-017L
2. a. Long Course Title: Introduction to Meteorology Lab
   b. Short Course Title: INTRO METR LAB
3. a. Catalog Course Description:
   This laboratory course is designed to reinforce and enhance the material covered in PH-017, Introduction to Meteorology. It includes activities about the earth's atmosphere, energy budgets, air pollution and global warming, clouds and precipitation, weather systems and forecasting, and severe weather.
   b. Class Schedule Course Description:
   This laboratory course is designed to reinforce and enhance the material covered in the lecture portion of Introdution to Meteorology.
   c. Semester Cycle (*if applicable*): This course is to be offered once every other academic year.
   d. Name of Approved Program(s):
   - ENVIRONMENTAL SCIENCES AS Degree and Transfer Preparation
4. Total Units: 1.00 Total Semester Hrs: 54.00
   Lecture Units: 0 Semester Lecture Hrs: 0
   Lab Units: 1 Semester Lab Hrs: 54.00
   Class Size Maximum: 30 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
   Prerequisite: ENG 061
   Corequisite: PH 017 or previously completed
6. Textbooks, Required Reading or Software: *(List in APA or MLA format.)*
   a. Farmer, Carl. Introduction to Meteorlogy Lab Manual. Compilation of Laboratory Activities , 09-01-2018.
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 square roots and solve square root equations.

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

h. 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.

i. 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.

j. 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.

k.

Use dimensional analysis appropriately in applications

- MATH 054 - Use dimensional analysis appropriately in applications.

l. Demonstrate an awareness of the various textbook formats and writing styles.

- ENG 061 - Recognize features of style such as purpose, audience and tone integrate these elements into academic and professional writing.
- ENG 061 - Utilize a handbook to properly cite and document source material in MLA format.

m. Effectively use source material to serve as examples and explanations to develop focused and relevant 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. Adequately negotiate a library to find a variety of source material for research including: 1) periodicals; 2) books; 3) electronic data bases; and 4) on-line sources.

- 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.

o.

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

- PH 017 - State Newton's three laws of motion and give examples or each.

p.

Name the important forces affecting the behavior of the air.

- PH 017 - Name the important forces affecting the behavior of the air.

q.

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

- PH 017 - Provide examples of atmospheric circulations on five different scales of size and time.

r.

Explain the concepts of temperature, pressure, density, and phase change in terms of the molecular model and/or kinetic theory of gases.

- PH 017 - Explain the concepts of temperature, pressure, density, and phase change in terms of the molecular model and/or kinetic theory of gases.

s.

Describe the interaction of the different scales of atmospheric circulation.

- PH 017 - Describe the interaction of the different scales of atmospheric circulation.

8. Course Content and Scope:

Lecture:

Laboratory Course

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

1. Surface Weather Observations
2. Temperature Structure of the Lower Atmosphere
3. Radiative Energy Transfer
4. The Greenhouse Effect
5. Humidity Variables
6. Thermodynamic Diagrams
7. Static Stability and Clouds
8. Freezing of Water: Ice Nucleation
9. Interpreting Weather-Satellite Images
10. Force Balance and Atmospheric Motion
11. Frontal Disturbances - Part I: Surface Charts
12. Frontal Disturbances - Part II: The Jet Stream and Surface Weather

9. Course Student Learning Outcomes:

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

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. Name the five most common gases in the earth's atmosphere and their approximate concentrations.
f. 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.
g. Name five major layers of the atmosphere, their approximate altitudes, and some identifying features of each layer.
h. Compare and contrast the concepts of energy, heat, and temperature.
i. Explain why the amount of incoming solar radiation varies with latitude, time of day and time of year.
j. Explain how an object's reflectivity and specific heat affect the rate at which it may change temperature.
k. Calculate an energy budget, given values for various energy fluxes.

Part II.

m. Describe the roles played by winds, atmospheric stability, and topography in the dispersal of air pollutants.
n. Utilize energy budget relations to trace the potential of greenhouse gases bringing about global temperature change.
o. Describe examples of how an enhanced greenhouse effect can lead to changes in other atmospheric variables.
p. List observational evidence in support of and in opposition to the hypothesis of global warming, pointing out limitations or uncertainties in such evidence
q. Describe potential impacts of global warming on the earth's geography and on human activities.

Part III.

s. Define equilibrium and explain how the amount of water vapor at equilibrium varies with temperature.
t. 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.
u. Describe how humidity varies diurnally, annually, and by location, and discuss its impact on human health.
v. Explain the roles played by atmospheric particles in the formation and growth of cloud particles.
w. Identify clouds from each of the major cloud groups and describe how they form.
x. Distinguish between stable and unstable clouds.
y. Interpret atmospheric soundings to identify stable layers, unstable layers, inversions, and clouds.
z. Apply thermodynamic diagrams to solve a variety of problems in atmospheric thermodynamics.
aa. Describe two processes why which precipitation forms.
ab. Explain how different types of precipitation form.
Part IV.
ad. Define geostrophic balance and draw a force diagram to illustrate it.
ae. Explain how temperature patterns determine upper level pressure patterns.
af. Explain the relationship between fronts and jet streams.
ag. Identify warm and cold air advection in a layer through vertical changes in horizontal wind direction.
ah. Identify different air mass source regions.
ai. Classify air masses on weather maps and by their radiosonde soundings.
aj. Locate and label fronts according to their type on a weather map.
ak. Describe typical weather conditions that accompany different types of air masses and fronts.
al. Identify examples of divergence and vorticity in wind flow patterns and describe how cyclone development is related to these patterns and other factors.
am. Describe, compare, and contrast several basic forecasting methods.
an. Utilize forecasting methods to make forecasts of weather map features and local weather.
ao. Interpret a computer weather forecast correctly.
Part V.
aq. 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.
ar. Describe the ENSO cycle, including El Nino and La Nina events.
as. Sketch the stages in the development of a typical thunderstorm, showing wind flow patterns, temperatures, and precipitation.
at. Describe conditions under which tornadoes form.
au. Name the conditions required for a hurricane to form.
av. Locate on a map the regions of frequent hurricane formation and their path.
aw. Sketch a cross section of a hurricane, indicating all structural components and general patterns of wind flow, air pressure, temperature, clouds, and precipitation.
ax. Identify techniques used in hurricane forecasting, how accurate they are, and the prospects of improving their accuracy.

11. Methods of Instruction: *(Integration: Elements should validate parallel course outline elements)*
    a. Activity
    b. Experiential
    c. Laboratory

    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: 18.00
    Outside Class Hours: 0
    a. In-class Assignments

    Complete Assigned Laboratory exercises
    Keep laboratory results in log book to be submitted for grading

b. Out-of-class Assignments

Preparation for Laboratory actitivies

13. Methods of Evaluating Student Progress: *The student will demonstrate proficiency by:*
    - Guided/unguided journals
    - Laboratory projects
    - Field/physical activity observations
    - Presentations/student demonstration observations
    - Group activity participation/observation
    - Product/project development evaluation
    - Student participation/contribution

14. Methods of Evaluating: Additional Assessment Information:

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 with Lab

A: Physical Science without Lab

A: Physical Science, Lab only

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
CSU	San Jose State University	METR 060	Meteorology I	2017
UC	UCLA	A&O SCI 3L	Introduction to Atmospheric Laboratory	2018

17. Special Materials and/or Equipment Required of Students:

18. Materials Fees: ☐ Required Material?

Material or Item	Cost Per Unit	Total Cost

19. Provide Reasons for the Substantial Modifications or New Course:

    New Course to accompany Physics 17 Lecture

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]: CCC000593720
    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: 30
    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*

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: Yes

28. Originator Carl Farmer Origination Date 2/08/18