PHYS 1150

Division: Natural Science and Mathematics
Department: Physics
Course: PHYS 1150
Title: Introduction to Meteorology
Catalog Description:

PHYS 1150 is an introductory course in the science of meteorology. The student is exposed to the physical, chemical, and dynamic processes of the atmosphere. Scientific principles that govern the circulation of the atmosphere, heat imbalance, radiation, cloud formation,weather prediction, severe weather, fronts, halos, and rainbows are analyzed. The course is designed to apply toward physical science general education requirements.

General Education Requirements: Physical Science
Semesters Offered: Fall
Credit/Time Requirement: Credit: 2; Lecture: 2; Lab: 0
Clock/Hour Requirements: 0
Offered for Non-Credit: No
Prerequisites: High School Algebra

Corequisites: None

Justification:

This course is an option to satisfy the physical science component of the general education requirements. Weather impacts almost everyone's life in one form or another. The understanding of the science and the why behind meteorology allows people to more readily adapt to their environment. The course numbering and department designation among the senior institutions in Utah is not uniform. This course is a subset of METEO 1010 at the University of Utah, BMET 2000 at Utah State University, and METO 1010 at Utah Valley State College, all of which are 3 semester hours.

Student Learning Outcomes:

Upon successful completion of this course, students will:

- know some important scientific laws and principles, such as those that govern thermodynamics, pressure, fluids, change of state, radiation, and light
- also understand that science is a process to gain knowledge, and that the scientific method is the key in obtaining this knowlege
- be able to solve paper and pencil physics problems and apply them to real life.
- believe that the physical world is interesting, and that science is a valuable way to understand it.

Content:

This course will include:

- atmosphere: origin, composition, and structure
    - evolution of the atmosphere
    - probing the atmosphere
    - temperature profile of the atmosphere
    - the ionosphere and the aurora
- radiation
    - electromagnetic radiation
    - radiation laws
    - input of solar radiation
    - solar radiation and the atmospere
    - the stratospheric ozone shield
    - solar radiation and the Earth's surface
    - solar radiation budget
    - infrared response and the Greenhouse Effect
    - radiation measurement
- heat and temperature
    - distingishing heat and temperature
    - temperature scales
    - temperature measurement
    - heat units
    - transport of heat
    - thermal response
    - heating and cooling degree days
    - the maritime influence on temperature
- heat imbalances and weather
    - heat imbalance: atmosphere versus Earth's surface
    - heat imbalance: variation by latitude
    - weather: response to heat imbalances, and change of state
    - variation of air temperature
- air pressure
    - defining and measuring air pressure
    - air pressure units
    - pressure variation with altitude
    - horizontal pressure variations
    - high and low pressures
    - the gas law
- humidity and stability
    - the hydrologic cycle
    - the saturation concept
    - relative humidity
    - humidification and humidity measurement
    - achieving saturation
    - atmospheric stability
    - lifting processes
    -
- dew, frost, fog, and clouds
    - low level saturation processes

        - cloud development
        - classification of clouds
        - unusual clouds
    - precipitation, weather modification, and atmospheric optics
        - preciptiation processes
        - forms of precipitation
        - precipitation measurement
        - weather modification
        - atmospheric optics, mirages
    - the wind
        - forces that cause wind
        - effects of combined forces
        - continuity of wind
        - scales of weather systems
        - wind pressure
        - wind measurement
    - planetary scale circulation
        - idealized circulation pattern
        - pressure systems and wind belts
        - upper air westerlies
        - El Nino
    - air masses, fronts, cyclones, and anticyclones
        - air masses
        - frontal weather
        - midlatitude cyclones
        - anticyclones

General Education Outcomes:

6) Apply computational skills to a variety of contexts.
Students solve 20-30 homework problems and questions per chapter; many of which require computation. The students will see numerous examples involving computations that are applied to real life situations. They receive scores and feedback on their assignments to help them improve their skills.

7) Apply scientific reasoning to a variety of contexts.
Students are frequently asked to answer questions in front of the class. Material presented by the instructor will often be done in a manner that involves a careful path of scientific reasoning. The tests have a significant protion dedicated to conceptual questions, where students must apply scientific reasoning. The homework also requires scientific reasoning to solve the problems.

Key Performance Indicators:

- homework problems: 10%-25% of the final grade
- quizzes: 10%-25% of the final grade
- tests/special project: 30%-50% of the final grade

- comprehensive final exam: 15%-35% of the final grade

Representative Text and/or Supplies:

- *Meteorology The Atmosphere and The Science of Weather*, current edition.

Optimum Class Size: 20
Maximum Class Size: 36

Signatures:

I hereby submit this course syllabus:

Ted Olson, , Professor

I hereby find this course consistent with the goals and resources of the Physics Department:

Ted Olson, , Professor, Chair

I hereby find this course consistent with the goals and resources of the Natural Science and Mathematics Division:

Dan Black, EdD, Associate Professor, Dean

I have discussed the need for library resources related to this class with the person submitting the syllabus:

Lynn Anderson, MLIS, Technical Services Librarian (Main Campus)

Michelle Olsen, MLS, Campus Librarian (Richfield Campus)