SUS 103 : PHYSICAL SCIENCE OF CLIMATE CHANGE

Transcript title

Climate Change

Credits

4

Grading mode

Standard letter grades

Total contact hours

60

Lecture hours

30

Lab hours

30

Recommended preparation

MTH 060 or higher or minimum placement Math Level 10.

Course Description

Examines the science behind current environmental issues and sustainable solutions to problems. Focuses on the causes of human-caused climate change and potential mitigation from a science perspective. Lab included.

Course learning outcomes

1. Evaluate climate change scientific arguments with a systems-thinking approach and considering scientific uncertainty.
2. Explain how the scientific method is applied to climate change research.
3. Differentiate between environmental anomalies and climate change consequences.
4. Connect human activity to carbon dioxide levels, climate change, and impacts on ecosystem services.
5. Argue how climate change can be mitigated.
6. Sustainability outcome: Explain the interconnectedness of environmental, social, and economic systems in the context of chemistry.

Content outline

1. The unaltered climate
   a. Climate vs. weather, climate change vs. climate variability
   b. Understanding systems with scientific models
   c. Historical climate from data (atomic structure and isotopes)
   d. Composition and structure of the atmosphere (composition, nature of gases)
   e. Known interactions between matter and radiation;(radiation principles, types and interactions with atoms and molecules)
   f. The planetary energy budget, solar radiation, and the greenhouse effect
   g. Water: properties and effects on climate, land and oceans (properties of water, phase changes, energy absorbance and release, thermal expansion)
2. What changes have occurred as a consequence of human activity? How do we know?
   a. Carbon fuels and carbon dioxide (chemical change, combustion reactions, thermochemistry)
   b. Other anthropogenic greenhouse gas emissions
   c. Ocean acidification (acid-base theory, pH, acid-base chemistry)
3. What needs be done about it?
   a. The scale of the problem (sources and sinks, dimensional analysis, stoichiometry)
   b. Analysis of potential solutions: alternative fuels, individual vs. collective action

Required materials

An appropriate text may be required.

General education/Related instruction lists

- Science Lab