COCONINO COMMUNITY COLLEGE
COURSE OUTLINE

Prepared by: Bryan Bates 10/08/2013
Revised by: Curriculum Committee January 26, 2015
Status: Permanent
Effective: Fall 2015

A. Identification:
1. Subject: Environmental Studies (ENV)
2. Course Number: 253
3. Course Title: Water, Energy and Climate Change on the Colorado Plateau
4. Credit Hours: 3
5. Course Description: Learners will examine the nexus of water, energy and climate change on the Colorado Plateau. Course will examine fundamental principles of hydrology, climatology, historic human usage of energy and water, current patterns of water distribution and use, the different energy fuels and systems employed for electrical generation, and the current and projected effects of climate change on biota, ecosystems and future generations. Field trips required. Prerequisites: ENG 101, MAT 086, or Consent of Instructor. May be taken for S/U credit. Three lecture.

B. Course Goals:
To provide learners with:
1. a scientific understanding of the hydrology and water movement on the Colorado Plateau and the foundational geology of energy sources;
2. developing a historic context for understanding current water and energy problems;
3. examining how climate is currently and anticipated to affect biome structure and ecosystem integrity;
4. a foundational understanding of current problems enabling them to propose potential solutions to water, energy and climate problems, and assess the viability of such proposals whether such proposals are created in the class or the public domain.

C. Course Outcomes: Students will:
1. diagram the movement and storage of water from precipitation to rivers, lakes and aquifers;
2. map the location of large bodies of water on the Colorado Plateau, surface and subsurface;
3. apply Darcy's Law for the movement of water through and discharge from aquifers;
4. evaluate the historic factors leading to Colorado River Compact and resultant over-allotment of water to states;
5. outline the designated water allotments to Native American tribes and States with the pressures exerted through legal contracts for water supply by regional cities, energy production and agriculture;
6. evaluate the current issues of water quantity and quality relative to population growth of the Colorado Plateau and regional cities;
7. explore the sources of Flagstaff's water supply, current usage rates and future needs;
8. assess the documented effects of reclaimed water on aquatic organisms, potential ecological and human affects, and potential technological remediation to best clean reclaimed water;
9. define the fuels cycles of nuclear, fossil fuel and hydro-electric energy production;
10. compare and contrast the ecological and socio-economic impacts of each of the above fuels;

11. critique the scientific evidence for the occurrence and rate of climate change on the Colorado Plateau;
12. examine whether and how climate change may affect the biota, water and other resources of the Colorado Plateau;
13. and explore how the citizenry and/or governments of the Colorado Plateau can adapt in their behavior, regulatory systems and /or economic systems to best preserve ecological integrity and resource availability for future generations.

D. Course Outcomes Assessment will include a variety of assessment techniques including written exams and writing assignments.

E. Course Content will include:

1. Basic hydrology and climatology including:
    a. Darcy's law;
    b. recharge and discharge rate calculations;
    c. review of historic precipitation patterns ;
    d. orographic, evapo-transpiration and other factors affecting water availability;

2. History of water acquisition and Colorado River Compact (CRC) including:
    a. effect of Boulder Dam (aka Hoover) and California on need for water agreement;
    b. the CRC Convention and history;
    c. Native American water rights and challenges;
    d. the affect of major population centers and agricultural centers on water availability;

3. Water use and distribution including:
    a. current uses of water as function of populations;
    b. Flagstaff water sources, usage and future needs;
    c. the regulatory framework for use of water and wastewater (reclaimed);
    d. documented effects of reclaimed water on aquatic organisms;
    e. potential ecological effects of reclaimed water;
    f. potential human health effects of reclaimed water;
    g. potential technological remediation of reclaimed water;

4. Energy sources and ecological concerns including:
    a. hydroelectric production, locations, and efficiencies;
    b. uranium deposits (breccias pipes), mining processes, and concerns;
    c. fossil fuel deposits, extraction techniques, transportation, and efficiencies;
    d. use of water for processing, transporting, and cooling electric energy production;
    e. patterns of electricity use on Colorado Plateau and regional cities;

5. Climate change including:
    a. evaluate evidence as to nature and extent of climate change;
    b. effect of climate change on plant communities (biomes);
    c. indicator species and effects of climate change on different Classes of organisms;
    d. potential impact on future generations of Colorado Plateau citizens;
    e. ethical consideration of generational responsibility;