

Prepared by the Department of Natural Sciences and Life Fitness

Date of Departmental Approval:

Date approved by Curriculum and Programs: May 2, 2007

Effective: Fall 2007

1. Course Number: ENV140

Course Title: Introduction to Water: Concepts and Technologies

2. Description: Course provides the student with an in-depth, holistic perspective of the historical and cultural development of water uses, broadening the understanding of global and regional water issues. Students will apply critical thinking / problem-solving abilities to evaluate the delicate balance between the human need and environmental consequences (causes and effects). All aspects of past, present and future water use as a resource are discussed in detail including: navigation, hydrology, potable use, ecology, wastewater, environmental law, hydro-power generation, climate and regulatory authority.

3. Student Learning Outcomes (instructional objectives; intellectual skills):

Upon successful completion of this course, the student shall be able to:

- Recognize and identify cultural, geographical, political and socio-economic factors as they pertain to growth and the environment.
- Define surface and groundwater geology, including all factors of the Hydrologic Cycle.
- Differentiate between the trophic relationships, evaluate causes of degradation and examine natural / man-made influences (including chemical).
- Relate climatic conditions to global resource conditions.
- Know, explain and assess water rights laws and regulatory initiatives.
- Analyze and apply historical trends of development to contemporary environmental issues.
- Formulate opinions and solutions towards development of strategies to attain sustainable growth and environmental protection.

4. Credits: 3 credits

5. Satisfies General Education Requirement: No

6. Prerequisite(s): None

7. Semester(s) Offered: Fall

8. Suggested General Guidelines for Evaluation: Exams, quizzes, final exam, homework assignments, optional research paper

9. General Topical Outline (Optional):

- 1) Historical Water Use and Development (early civilizations)
 - a) Drinking Water
 - b) Irrigation & Flood Control
 - c) Water Transportation Development
 - d) Hydropower Development
- 2) Hydrologic Cycle, Climate & Weather
 - a) Hydrologic Cycle – cycle components, storage, lakes & reservoirs
 - b) Climate – air, ocean and effect of earth's axis
 - c) Monitoring Climate Change
 - d) Weather – temperature, air pressure, humidity, heating, wind
 - e) Floods / Drought
- 3) Surface Water Hydrology
 - a) Watersheds

- b) Overland Flow
 - c) Rivers – components, types & morphology
 - d) Lakes – types, ecological zones & thermal cycles
 - e) Transport & Deposition (sediments)
 - f) Water Measurement / Storage
 - g) Flood Events – frequency, mapping, flood zones
- 4) Groundwater Hydrology
- a) Aquifers – types, properties
 - b) Groundwater Movement
 - c) Groundwater Age
 - d) Locating / Mapping Groundwater
- 5) Water Quality
- a) Water Pollution – point & non-point descriptions
 - b) Basic Water Parameters – pH, temperature, turbidity, hardness, dissolved oxygen
 - c) Inorganic Chemicals
 - d) Organic Chemicals
 - e) Waterborne Diseases
 - f) Water Quality Management – fate & transport, watershed protection
- 6) Municipal & Irrigation Water Development
- a) Municipal Water Systems – Delivery systems / impacts for Los Angeles, New York, Lincoln & others
 - b) Irrigation – historical perspective, need, techniques
 - c) Drilling a Groundwater Well – components, methods, types
- 7) Dams
- a) Dam Basics – purpose, components, types & operations. Case studies of Hoover, Grand Coulee, Kingley and Three Gorges Dams. Also hydropower generation
 - b) Impacts of Dams
 - c) Dams & Locks for Navigation
- 8) Water Allocation Law
- a) Ancient Water Allocation – Code of Hammurabi & Justinian Code
 - i) Common law, Riparian Doctrine, Appropriative Doctrine, Prescriptive Doctrine
 - b) Water Allocation Law (A.D. 1200-1799)
 - c) Water Allocation Law (1800-1847)
 - d) Water Allocation Law (1848-1899)
 - e) Water Allocation Law (1900-Present)
 - f) Groundwater Doctrines
 - g) Interstate Compacts
 - h) Federal Reserved Water Rights
- 9) Federal Water Agencies
- a) US Corps of Engineers – history & duties
 - b) US Bureau of Reclamation – irrigation, dams, wetland act
 - c) US Geological Survey
 - d) US Fish & Wildlife Service
 - e) National Park Service
 - f) Bureau of Land Management
 - g) US Environmental Protection Agency
 - h) Natural Resources Conservation Service
 - i) US Forest Service
 - j) Federal Energy Commission
 - k) National Marine Fisheries Service
 - l) Federal Emergency Management Agency
- 10) Local, Regional, State & Multi-state Water Management Agencies
- a) Local Water Agencies – municipal, districts, levee districts, mutual ditch companies

- b) Regional Water Agencies – irrigation districts, conservancy districts, groundwater districts
 - c) State water Agencies
 - d) Multi-state Water Agencies – Chesapeake Bay & Missouri River Commissions
 - e) Water Mgt. in Mexico & Canada
- 11) Drinking Water & Wastewater Treatment
- a) Historical perspectives
 - b) Drinking Water Treatment Processes
 - c) Wastewater Treatment Processes – traditional, constructed wetlands, septic systems
- 12) Water Fish & Wildlife
- a) Early Fish & Wildlife Protection
 - b) Fish & Wildlife Protection in the 20th Century – NEPA Act, Endangered Species Act
 - c) Wetlands and Wildlife
- 13) Economics of Water
- a) Value of Water – resource versus commodity
 - b) Water as a Public Versus Private Good
 - c) Privatization
 - d) Water Affordability
 - e) Water Marketing
 - f) Water banking
 - g) Pollution Fees / Credits
 - h) Environmental Values
- 14) Water Use Conflicts
- a) Reasons for Conflicts – US
 - i) Middle East
 - b) Tragedy of the Commons
- 15) Emerging Water Issues
- a) Future Global Water Management Issues – population, pollution, environmental degradation, growth
 - b) Future Solutions – education, conservation, cooperation, balance