

**WILLIAM PATERSON UNIVERSITY
COLLEGE OF SCIENCE AND HEALTH
COURSE OUTLINE**

TITLE OF COURSE AND COURSE NUMBER:

Hydrology and the Environment
ENV 4700
3 credits

DESCRIPTION OF THE COURSE:

Water is becoming one of defining issues of our time, and water availability and quality will almost certainly be affected by changes in climate and land use. In this class students will explore the components of the hydrologic cycle (precipitation, evaporation, transpiration, infiltration, ground-water flow, surface runoff and stream flow), issues that have and will continue to impact the water cycle, and “Best Management Practices” for water sustainability. Through examples and case studies we will examine environmental issues around water resources globally and locally. Assignments include readings, fieldwork, problem-solving activities, and independent research projects. The class period will be formatted to be a mixture of fieldwork, lectures and discussions, and hands on activities.

COURSE PREREQUISITES:

ENV 1150

COURSE OBJECTIVES:

To provide students with a deeper understanding of all aspects of the hydrologic cycle, its reservoirs, and how water moves around earth; an understanding of various natural and human influences on water and its availability and quality; and a global perspective of water issues and management practices.

STUDENT LEARNING OUTCOMES:

1. Students will be able to effectively express themselves in written and oral form through their written reviews of presentations, and in class discussion of relevant topics.
2. Students will be able to demonstrate the ability to think critically and analyze data through oral presentations, class discussions, and written work.
3. Students will be able to demonstrate the ability to integrate scientific knowledge and ideas in a coherent and meaningful manner as evidenced by their presentations and papers.
4. Students will be able to locate and use scientific information for presentations and a research paper.
5. Students will be able to demonstrate their ability to work within a group on field assignments.
6. Students will be able to differentiate between reliable and unreliable sources of information when researching their presentations and paper.
7. Students will demonstrate increased skills in reading maps, fieldwork and data collection and analysis.

TOPICAL OUTLINE OF THE COURSE CONTENT: ** denotes fieldtrips

1. Perspectives on water and environmental issues
 - a. Distribution of water on Earth
 - b. Ecosystems, biomes and watersheds
 - c. Global Water Use
 - d. The Global Water Budget
 - e. Global population growth and human proliferation
2. The water environment of early civilizations
 - a. Water and agriculture: the basis of civilization
 - b. Ancient drinking water and sanitation
 - c. Water and the environment
 - d. Historical perspectives: Humans and the environment
3. The hydrologic cycle
 - a. Weather, climate, El Nino & La Nina
 - b. The hydrologic cycle and human/natural dynamics
 - c. Climate impacts on water resources
 - d. A paleoclimate perspective

**** Tree-ring field sampling**
4. Water quality
 - a. The chemistry of water
 - b. Water quality failure
 - c. Clean water as a human right

**** Stream flow testing of the Molly Ann Brook**
5. Watershed basics
 - a. Watershed delineation
 - b. Comparison of erosion in two major watersheds
 - c. Watershed structure
 - d. Watershed function
 - e. Water quality
6. Groundwater
 - a. The physical environment
 - b. Interactions of surface and groundwater
 - c. Water supply interactions
 - d. The chemical and aquatic environment
7. Lakes and ponds
 - a. Lake types
 - b. Lake structure
 - c. Lake chemistry
 - d. Food webs
 - e. Two contrasting lake views
8. Rivers and streams
 - a. River system function
 - b. Physical features of a river system
 - c. Flow
 - d. Fluvial geomorphology: Forming a river
 - e. River and stream ecology

9. Wetlands

- a. Wetland features and functions
- b. Wetland types and classification
- c. Trends in wetlands

**** Wetland field tour and sampling (Great Swamp)**

10. Dams and reservoirs

- a. Types of dams
- b. Purpose of dams
- c. Impacts of dams and reservoirs
- d. Rivers, dams and rehabilitation efforts
- e. Is dam removal the answer?

11. Drinking water and wastewater treatment

- a. Early drinking water treatment
- b. Discovery of the microscope
- c. Epidemics and the microscope
- d. Federal protection of drinking water in the US
- e. Source water protection
- f. Modern drinking water health issues
- g. Wastewater treatment and issues

**** Field visit to a wastewater treatment plant**

12. Water allocation law

- a. Historical development of water allocation laws
- b. Development of the Riparian Doctrine
- c. Doctrine of Prior Appropriations
- d. Groundwater allocation laws
- e. Interstate compacts
- f. New water allocation laws and international efforts

13. Roles of federal, regional, state, and local water management

- a. US federal water agencies and Issues
- b. Privatization of water systems
- c. Global water issues

14. Water conflicts, solutions, and our future

- a. Tragedy of the commons
- b. Safe drinking water
- c. Surface and groundwater conflicts
- d. Environmental restoration
- e. Global climate change and impacts on water

GUIDELINES/SUGGESTIONS FOR TEACHING METHODS AND STUDENT LEARNING ACTIVITIES:

Lecture, class discussion, research projects, guest speakers, and field trips

GUIDELINES/SUGGESTIONS FOR METHODS OF STUDENT ASSESSMENT (STUDENT LEARNING OUTCOMES):

Quizzes, final exam, research project, homework assignments

SUGGESTED READINGS, TEXTS, OBJECTS OF STUDY:

Pennington, Karrie Lynn and Thomas V. Cech (2010). *Introduction to Water Resources and Environmental Issues*, Cambridge University Press, 468 pp.

Pearce, Fred (2006). *When the Rivers Run Dry: Water, the Defining Crisis of the 21st Century*, Beacon Press, 336 pp.

BIBLIOGRAPHY OF SUPPORTIVE TEXTS AND OTHER MATERIALS:

Watt M., 2000, A Hydrologic Primer for New Jersey Watershed Management: Water-Resources Investigations Report 00-4140, 2000, United States Geologic Survey: USGS200NJwatershed-4140.pdf

Dai 2010, Increased Drought under Global Warming

PREPARER'S NAME AND DATE:

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May 1997

ORIGINAL DEPARTMENTAL APPROVAL DATE:

July 1997

REVISER'S NAME AND DATE:

Nicole Davi
December 2014

DEPARTMENTAL REVISION APPROVAL DATE:

December 2014