ESS 0008 - CALIFORNIA WATER

Catalog Description

Hours: 108 (54 lecture, 54 laboratory)
Description: Interdisciplinary examination of California water ecosystems, infrastructure, uses, and impacts. Students will learn about: hydrology; aquatic ecosystems including rivers, lakes, wetlands, estuaries, and marine environments; water infrastructure including dams, levees, aqueducts, and wastewater treatment facilities; groundwater recharge, withdrawal, use and impacts; the role of water in agricultural, urban, environmental and political systems; water quality; water storage and transfers; water policy; and conflicts arising from water scarcity. May include field trips during or in lieu of lab time. Students may be required to provide their own transportation. (CSU, UC)

Course Student Learning Outcomes

- CSLO #1: Describe historic and current utilization of water resources, water policies, and conflicts arising from water scarcity in California.
- CSLO #2: Identify the physical and biological attributes of water systems in California, including sources, quantity, quality, and biodiversity.
- CSLO #3: Outline a sustainable vision for the future of California water resources and aquatic ecosystems.

Effective Term

Fall 2020

Course Type

Credit - Degree-applicable

Contact Hours

108

Outside of Class Hours

108

Total Student Learning Hours

216

Course Objectives

Lecture Objectives:
1. Construct a diagram of the water cycle. (Lecture Outline I)
2. Identify and describe types in waterways in California, and locate these systems on a map. (Lecture Outline I)
3. Identify and describe aquatic organisms. (Lecture Outline III)
4. Compare and contrast California aquatic systems before and after the development of dams, levees, canals and other water infrastructure. (Lecture Outline III)
5. Examine the needs, benefits and impacts of the Central Valley Plan, the State Water Plan, and local water projects including those done by LADWP and SFPUC. (Lecture Outline II)
6. Assess the economic, political and ecological importance of aquatic systems; deduce valid conclusions concerning human and ecosystem needs. (Lecture Outline I)
7. Predict future changes/needs/impacts based upon evidence obtained in class. (Lecture Outline IV)
8. Organize and formulate basic hydrologic and fluvial systems, including streamflow and transportation processes, upper and lower reaches characteristics, and impacts on the landscape; (Lecture Outline I)
9. Describe past and present water policy in California and assess policy impacts on ecosystems and economies. (Lecture Outline I, II)
10. Predict how climate change and population growth will impact California water resources in the future. (Lecture Outline IV)
11. Brainstorm sustainable solutions to California water challenges. (Lecture Outline IV)
Lab Objectives:
1. Evaluate an extended water cycle relating most of the aquatic habitat types in California. (Lab Outline II)
2. Identify and describe types of waterways in California, and locate these systems on a map. (Lab Outline II)
3. Demonstrate the proper use of a taxonomic key for the identification of organisms in the field. (Lab Outline I)
4. Describe the scientific method and the process of science. (Lab Outline I)
5. Utilize a variety of techniques, instrumentation and equipment to collect and document aquatic data including stream discharge, turbidity, and benthic macroinvertebrate samples. (Lab Outline III)
6. Design a controlled experiment and assess the relationship between the dependent variable and the independent variable. (Lab Outline I)
7. Utilize the Internet to collect aquatic data such as stream discharge, precipitation, and water quality. (Lab Outline I, III)
8. Synthesize, document and display data in appropriate form, such as through line graphs, pie charts, tables and maps. (Lab Outline I, III)
9. Produce reports summarizing information acquisition, analysis, and interpretation of results. (Lab Outline I, III)
10. Apply critical thinking to analyze topics and reason logically to interpret data and other scientific information. (Lab Outline I-V)
11. Demonstrate an understanding of major ecological principles and the biotic and abiotic factors that regulate aquatic ecosystems. (Lab Outline II)
12. Analyze impacts on ecosystems as well as the risk for humans exposed to select environmental pollutants. (Lab Outline III, IV)
13. Demonstrate ability to work collaboratively to generate solutions to complex environmental problems, taking into account diverse stakeholder perspectives. (Course Outline V)

General Education Information

- Approved College Associate Degree GE Applicability
  - AA/AS - Life Sciences
  - AA/AS - Physical Sciences
  - AS - Life Science Lab
  - AS - Physical Science Lab
- CSU GE Applicability (Recommended-requires CSU approval)
  - CSUGE - B1 Physical Science
  - CSUGE - B2 Life Science
  - CSUGE - B3 Lab Activity
- Cal-GETC Applicability (Recommended - Requires External Approval)
- IGETC Applicability (Recommended-requires CSU/UC approval)

- IGETC - 5A Physical Science
- IGETC - 5B Biological Science
- IGETC - 5C Laboratory Science

Articulation Information

- CSU Transferable
- UC Transferable

Methods of Evaluation

- Classroom Discussions
  - Example: Students may be asked to work collaboratively to create a vision of water policy in the future. Discussion points may include: climate change and population growth predictions; historic and current water policy; biodiversity and ecosystem needs; current and future water infrastructure.
- Essay Examinations
  - Example: An exam question asking students to defend a position of either dismantling or maintaining the O'Shaughnessy Dam in Yosemite National Park. Students must provide valid data in support of their argument, and demonstrate that they understand both sides of the debate.
- Objective Examinations
  - Example: Students may be given short answer, fill-in, multiple-choice, and true-false questions about historic and current water policy in California. Example: Compare and contrast riparian and appropriative water rights in California.
- Problem Solving Examinations
  - Example: Either in the lab or in the field students might observe and identify benthic macroinvertibrate specimens and determine their identity utilizing appropriate taxonomic keys.
- Projects
  - Example: Students might use the scientific method to develop carry out an experiment, such as the factors affecting aquatic macroinvertebrates, variations in aquatic systems. This might occur in the lab or in the field (on or off campus).
- Reports
  - Example: Students may conduct research utilizing peer-reviewed journal articles and other robust valid sources, and write a report about the economic importance of California water resources.
- Skill Demonstrations
  - Example: In small groups in the field, students might demonstrate their ability to measure stream profile, area, velocity and discharge utilizing field tape, stream gauge, flow meter, and data sheets.

Repeatable

No

Methods of Instruction

- Laboratory
- Lecture/Discussion
- Distance Learning

Lab:

1. Instructor provides a presentation about the various types of aquatic benthic macroinvertebrates (BMI) likely to live in a particular freshwater ecosystem, the water quality requirements of different BMI, and how those organisms are best be surveyed in aquatic systems. The instructor will demonstrate various BMI sampling and identification techniques for assessing water quality. The students will be asked to effectively demonstrate the sampling and identification methods in the field.

Lecture:

1. Instructor guides a class discussion about the differences between California's pristine waterscape and the current conditions. Maps will be provided so that students can see the pristine waterscape adjacent to a map of current dams and major water transport systems in California. Students will be asked to apply reading and previous lecture material to surmise impacts of the changes on the hydrologic cycle, ecosystems and human communities, both up and downstream of the infrastructure.

Distance Learning

1. Following an online instructor lecture on California waterways, in a report, students will identify and describe types in waterways in California and post for other students to review and provide comment.

Typical Out of Class Assignments Reading Assignments

1. Read chapter "California Water Landscape" in Introduction to Water in California, 2e (Carle, 2016, p. 37-87). Describe California's "pristine waterscape", groundwater, and hydrologic regions. 2. Read Chapter "Pathways to Reform" in Managing California's Water: From Conflict to Reconciliation (Hanak et al, 2011). Be prepared to discuss your vision for creating a sustainable water landscape in California.

Writing, Problem Solving or Performance

1. Visit the USGS website and collect stream discharge data from two assigned watercourses. Use these data to construct a rating curve relating stream stage to discharge. Use monthly stream flow and climate data to examine seasonal runoff patterns and daily flow data to construct peak flow event hydrographs. Relate runoff patterns to the different processes in two California catchments. 2. Write a short critical thinking essay that compares the pros and cons of the O'Shaughnessy Dam in Hetch Hetchy Valley in Yosemite National Park.

Other (Term projects, research papers, portfolios, etc.)

Term project: Visit at least two aquatic ecosystems. Evaluate and compare each based upon the biodiversity of the area, the abiotic factors, the human impacts, and the management of each in a field notebook.

Required Materials

- Introduction to Water in California
  - Author: David Carle
  - Publisher: UC Press
  - Publication Date: 2016
  - Text Edition: 2nd
  - Classic Textbook?:
  - OER Link:
  - OER:

- The Great Thirst: Californians and Water-A History
  - Author: Norris Hundley Jr.
  - Publisher: UC Press
  - Publication Date: 2001
  - Text Edition: Revised
  - Classic Textbook?:
  - OER Link:
  - OER:
- Water and the California Dream: Historic Choices for Shaping the Future
  - Author: David Carle
  - Publisher: Counterpoint
  - Publication Date: 2016
  - Text Edition: Revised
  - Classic Textbook?:
  - OER Link:
  - OER:
- Field Guide to California Rivers
  - Author: Tim Palmer
  - Publisher: UC Press
  - Publication Date: 2012
  - Text Edition: 1st
  - Classic Textbook?:
  - OER Link:
  - OER:
- California Water Lab Manual
  - Author: K Gilbert
  - Publisher: Sierra College
  - Publication Date: 2019
  - Text Edition: 1st
  - Classic Textbook?:
  - OER Link:
  - OER:

Other materials and-or supplies required of students that contribute to the cost of the course.

Field notebook/journal