

Units: 4

Term—Day—Time: Fall, 2016, Tuesdays and Thursdays
11:00 a.m.-12:20 p.m.

Location: Taper Hall, THH 102 (lectures), Hancock
Foundation, AHF 145A (labs)

Co-Instructor: Dr. John P. Wilson

Office: AHF B55F

Office Hours: Tuesdays and Fridays 9:00-10:00 a.m. or by
appointment

Contact Info: jpwilson@usc.edu, 213-740-1908

Co-Instructor: Dr. Daniel N. Warshawsky

Office: AHF B55B

Office Hours: Tuesdays 3:00-4:00 p.m., Thursdays 1:00-2:00
p.m., or by appointment

Contact Info: warshaws@usc.edu, 213-740-2876

Lab Instructor: Dr. Lisa Sedano

Office: AHF B57C

Office Hours: Wednesdays 12:00-1:00 p.m., Thursdays 1:00-
2:00 p.m., or by appointment

Contact Info: sedano@usc.edu, 213-740-9582

IT Help: Richard Tsung

Office: AHF 146

Hours of Service: By appointment

Contact Info: ctsung@usc.edu, 213-821-4415

Course Description

This course entails a comprehensive investigation into the multi-faceted dimensions of water on Earth. Topics range from micro-scale concerns (e.g. water properties, form, and behavior) to regional-scale issues (e.g. water resource distribution, groundwater mining, and watershed dynamics) to global-scale processes such as the hydrologic cycle including atmospheric and oceanic circulation. Although there are many perspectives from which to approach the topic of water (e.g. economic, legal, political, institutional, and engineering perspectives), we will situate our investigation within a scientific framework with particular focus on scientific methodologies and the unique insights that science is able to reveal.

Attention will also be directed to the human (social science) dimensions of water supply and demand, and the implications for past and future societies. Water has specific societal significance because it is essential for sustaining life, directly and indirectly. Water is a necessary component of most agricultural and industrial processes, and it serves a central role in global and regional transportation networks. There are extensive technological dimensions to meeting the challenges of (in)adequate water supply that are critical to human existence. We will examine these aspects through a series of case studies that simultaneously explore the water footprint of modern consumer societies and how various cultures and countries have been shaped by three of the world's largest and most iconic rivers: the Amazon, the Ganges, and the Yangtze.

This course satisfies the requirements for General Education Category E (Physical Sciences). Courses in this category are intended to bring to bear the perspectives of several scientific disciplines on a theme, illustrating the relevant scientific principles, their technological applications, and the societal significance and consequences. The GE designation further requires that the course content give students the opportunity to think critically through focused inquiry into a particular area of knowledge. Scientific methodologies, analytical techniques, and digital scholarship will be stressed.

The overall goal of the GE Program is to provide necessary context for an informed citizenry, and therefore these courses emphasize a broad sweep of knowledge and require active intellectual engagement with scientific principles. In practice, this means that students will be introduced to many concepts and terminologies that may be new and unfamiliar. The focus, nevertheless, will be on applying basic principles to specific problems rather than simple description, memorization, and recapitulation.

Learning Objectives

On completion of this course, students will be able to:

- Understand the special properties of water and the fundamental role it plays in the functioning of the Earth, with or without the presence or engagement of people.
- Understand the spatial and temporal character of water related processes and resources.
- Recognize the value of spatial knowledge, maps, and the spatial representation of water data.
- Understand the basic physical, environmental, and social aspects of the world's water supply.

Prerequisite(s): None
Co-Requisite (s): None
Concurrent Enrollment: None
Recommended Preparation: None

Course Notes

In addition to the lectures, there are a series of laboratory experiences that are designed to introduce you to the tools of scientific inquiry and to give you practical experience in implementing these tools to explore various problems within the framework of the scientific method. These assignments are linked to the lectures and class discussions, but do not duplicate the lecture experience. You must register for one laboratory session in addition to registering for the class itself. Your weekly laboratory assignments will be graded and returned, and the final exam will include material from the class and laboratory component.

No make-up dates will be offered for missed quizzes or exams, so mark the appropriate dates on your calendars! If you have a legitimate conflict, speak with John Wilson, Daniel Warshawsky, or Elisabeth Sedano as soon as possible so we can make alternative arrangements.

Technological Proficiency and Hardware/Software Required

The mapping software and geospatial data required for course assignments will be accessed using computing resources provided by the Spatial Sciences Institute.

Required Readings

Davie, T. 2016. *Fundamentals of Hydrology*. Third Edition. New York: Routledge.
(Available for purchase in the USC bookstore)

Hoekstra, A. Y. 2013. *The Water Footprint of Modern Consumer Society*. New York: Routledge.
(Available for purchase in the USC bookstore)

Jones, J. A. A. 2010. *Water Sustainability: A Global Perspective*. New York: Routledge.
(Available for download as an e-book through USC libraries)

Description and Assessment of Assignments

Class Reports (8%): Two class reports are required for this class. Although topics vary each semester, reports typically ask students to conduct independent research and integrate course concepts into an essay. Each report contributes up to 4% towards a student's final grade.

Weekly Quizzes (28%): Once a week, students will be quizzed on material from the previous week of class. These quizzes will be given either at the beginning or end of class. There are 14 total quizzes, and each quiz contributes up to 2% towards the student's final grade.

Lab Assignments (14%): There are seven lab assignments in this class. Each lab assignment is completed in the weekly two-hour lab session. Students utilize their knowledge of water resources and geospatial mapping technologies to successfully complete each of these lab assignments.

Story Map Project (20%): As part of this class, students create a story map project in Labs 8 through 12. These lab sessions will combine individual as well as collaborative work and

involve the creation and publication of a series of maps that will be used along with other digital materials (charts, photographs, text, existing and possibly live-streamed sensor data, video clips, video streaming, etc.) to tell a water-related story. These stories will be presented in labs and the best stories will be published on the Spatial Sciences Institute website.

Final Examination (30%): The final exam in this class covers material from all parts of the class, including lecture, labs, and readings, spread across the entire semester. The date and time for this exam is available in the USC schedule of classes.

Assignment	Number	% of Grade
Class Reports	2	8
Weekly Quizzes	14	28
Lab Assignments	7	14
Story Map Project	1	20
Final Exam	1	30
TOTALS	25	100

Assignment Submission Policy

Assignments will be submitted for grading via Blackboard using the due dates specified in the Course Schedule below.

Additional Policies

Students are expected to attend and participate in every class session and to complete and upload all assignments before the deadlines detailed in the Course Schedule. No late work is accepted.

Course Schedule: A Weekly Breakdown

Weeks	Topics/Daily Activities	Readings and Homework	Deliverables and Due Dates
Week 1 8/23 8/25	Introduction to Class Special Properties of Water	Davie, Ch. 1	No deliverables
Week 2 8/30 9/1	Hydrologic Cycle Role of Space & Time in Hydrology Introduction to the hydrologic cycle and the role of space and time in framing hydrologic knowledge	No reading	Weekly quiz in lecture
Week 3 9/6 9/8	Precipitation Evaporation Exploration of the processes of precipitation and evaporation and the factors controlling their distribution across space and time	Davie, Ch. 2-3	Weekly quiz in lecture Lab 1 is due to Blackboard by 11:55 p.m. the same day as your lab session

Week 4 9/13 9/15	Storage Groundwater Discussion of the hydrologic processes associated with the storage and groundwater in specific kinds of landscapes	Davie, Ch. 4	Weekly quiz in lecture Lab 2 is due to Blackboard by 11:55 p.m. the same day as your lab session
Week 5 9/20 9/22	Runoff Rivers & Streamflow Discussion of hydrologic principles behind runoff, rivers and related fluvial processes	Davie, Ch. 5	Weekly quiz in lecture Lab 3 is due to Blackboard by 11:55 p.m. the same day as your lab session
Week 6 9/27 9/29	Rivers, Sediment Production & Transport Amazon Discussion of the hydrologic principles underlying streamflow analysis and modeling, and an introduction to the Amazon River in Brazil	Davie, Ch. 6	Weekly quiz in lecture Lab 4 is due to Blackboard by 11:55 p.m. the same day as your lab session
Week 7 10/4 10/6	Rivers, Floods & Floodplains Yangtze Discussion of the role of floods and floodplains in hydrologic systems and an introduction to the Yangtze River in China	No reading	Weekly quiz in lecture Lab 5 is due to Blackboard by 11:55 p.m. the same day as your lab session
Week 8 10/11 10/13	Atmospheric Circulation Oceanic Circulation The role of atmospheric and oceanic circulation in the functioning of the Earth	No reading	Weekly quiz in lecture Lab 6 is due by 11:55 p.m. the same day as your lab session
Week 9 10/18 10/20	Water Quality Ganges Discussion of the role and importance of water quality and the likely sources of contaminants, plus an introduction to the Ganges River in India	Davie, Ch. 7	Weekly quiz in lecture Lab 7 is due by 11:55 p.m. the same day as your lab session Report #1 is due to Blackboard by 11:55 p.m. on 10/21
Week 10 10/25 10/27	Development, Urbanization, & Modernization Los Angeles Discussion of the role of development, urbanization and modernization in shaping human use of water resources; history of water in Los Angeles as seen through <i>Cadillac Desert</i>	Jones, Ch. 1-2	Weekly quiz in lecture Lab 8 is due to Blackboard by 11:55 p.m. the same day as your lab session

Week 11 11/1 11/3	Uneven Water Access Concept of Virtual Water Exploration of the connections between poverty, governance and uneven water access, and the role of virtual water and water footprints in clarifying and understanding human utilization of water resources	Hoekstra, Ch. 1-2 Jones, Ch. 3-4 & 8	Weekly quiz in lecture Lab 9 is due to Blackboard by 11:55 p.m. the same day as your lab session
Week 12 11/8 11/10	Water Footprints of Global Products Bottled Water Discussion of the water footprint associated with various food products, cotton, and flowers and an exploration of bottled water in the U.S. and its impact on the environment	Hoekstra, Ch. 3-5 & 7 Jones, Ch. 5-7, 9, & 12-14	Weekly quiz in lecture Lab 10 is due to Blackboard by 11:55 p.m. the same day as your lab session
Week 13 11/15 11/17	Environmental Impact Climate Change Exploration of the societal and scientific challenges accompanying climate change	Jones, Ch. 10	Weekly quiz in lecture Lab 11 is due to Blackboard by 11:55 p.m. the same day as your lab session
Week 14 11/22	Water Resources in a Sustainable World Exploration of the kinds of water infrastructure and use patterns that will be needed to build more resilient and sustainable communities	Hoekstra, Ch. 6 Jones, Ch. 15-19	Weekly quiz in lecture Lab 12 is due to Blackboard by 11:55 p.m. the same day as your lab session
Week 15 11/29 12/1	Geodesign Class Review Discussion of the ways in which the principles of geodesign might be used to build a more resilient and sustainable world as well as a review of class and lab material in preparation for the Final Exam	Jones, Ch. 20-22	Report #2 is due to Blackboard no later than 11:55 p.m. on 12/2
FINAL EXAM 12/13			8:00 a.m. – 10:00 a.m., Tuesday, December 13

Statement on Academic Conduct and Support Systems

Academic Conduct

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Section 11, *Behavior Violating University Standards* <https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions>. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* <http://equity.usc.edu> or to the *Department of Public Safety* <http://adminopsnet.usc.edu/department/department-public-safety>. This is important for the safety of the whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. *The Center for Women and Men* <http://www.usc.edu/student-affairs/cwm/> provides 24/7 confidential support, and the sexual assault resource center webpage <http://sarc.usc.edu> describes reporting options and other resources.

Support Systems

A number of USC’s schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the *American Language Institute* <http://dornsife.usc.edu/ali>, which sponsors courses and workshops specifically for international graduate students. *The Office of Disability Services and Programs* http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information* <http://emergency.usc.edu> will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.