

*The Water Course*  
**Geophysics 104/204 Earth Systems 104/204**

**Class Meetings:**

1:30-2:30 Monday, Wednesday, Friday.  
Mitchell Building Room 350/372

**Course Website:** Lectures, assignments, announcements, tutorials and any handouts will be posted on the Canvas website: [www.canvas.stanford.edu](http://www.canvas.stanford.edu)

**Instructor:** Rosemary Knight [rknight@stanford.edu](mailto:rknight@stanford.edu)

Office hours: Drop in TBD : But I can meet other times if you email me.

**TAs:**

Matt Lees [mlees@stanford.edu](mailto:mlees@stanford.edu)

Matt's office hours: 2:30-4:00pm on Mondays, (location TBD). Available other times via appointment, please email me.

Natan Holtzman [nholtzma@stanford.edu](mailto:nholtzma@stanford.edu)

Natan's office hours TBD

**Course Description**

The Central Valley of California provides a third of the produce grown in the U.S., but recent droughts and increasing demand have raised concerns about both food and water security. The pathway that water takes from rainfall to the irrigation of fields or household taps ("the water course") determines the quantity and quality of the available water. Working with various data sources (measurements made on the ground, in wells, and from satellites) allows us to model the water budget in the valley and explore the recent impacts on freshwater supplies.

**Learning Goals for *The Water Course***

Students will:

- experience the challenge and satisfaction of quantifying reality – i.e. “doing the math” - to capture the essential elements of the human/natural freshwater system, making and justifying valid approximations and assumptions required to simplify complex systems.
- recognize the differences between biophysical and societal aspects of water issues.
- discover the wide range of data sets, publicly available, that provide critical information about the human/natural freshwater system.
- work with various sources of data, learning how to analyze, synthesize, and describe the data to quantify trends; think critically and creatively about how to project these trends into the future.
- describe the “water course” - the pathway - that water takes in a natural system and engineering system.

**WAY – Applied Quantitative Reasoning**

Why this is important - We make many decisions in life on the basis of large amounts of data, which can be incomplete or otherwise imperfect, and fraught with uncertainties. Cultivation of

this way of thinking will give you a familiarity with actively analyzing complex phenomena, along with a stronger sense of how to predict and alter the behavior of complex systems - even in the face of uncertainty.

### **WAY – Scientific Method and Analysis**

Why this is important - Scientific literacy is critical to complex problem solving and touches on many aspects of human life. Courses in Scientific Method and Analysis will enhance your ability to analyze and synthesize scientific information about the natural and physical world, understand the limitations and strengths of existing theories, ask strategic questions, and assess empirical evidence.

### **Workload Expectations**

As this is a four-unit course, students are expected to devote at least nine hours of work each week outside of class time. (4 units x 3 hours/unit - 3 hours in class = 9 hours outside of class).

### **Grading/Course Requirements**

All required materials are to be submitted through Canvas.

The focus of the course is a project through which each student develops a water budget for a county in the Central Valley. There are four components associated with the project: weekly project-section assignments (that allow you to complete the sections of your project), discussions in class/online, a final written project report, and a power-point presentation providing a high-level overview (2-3 slides) of the final project.

Below is the list of course requirements and the grade breakdown:

Weekly Project Section Assignments: 45% of grade

Final Project Report: 40% of grade

Power Point Presentation: 5% of grade

Participation/Attendance: 10% of grade

Completion of all of the above is required to pass the course.

A grade from 90 to 100 is an A.

A grade from 80 to 89 is a B.

A grade from 70 to 79 is a C.

A grade from 60 to 69 is a D.

A grade below 60 is a failing grade.

**Rubric for Project Section Assignments** Total Marks = 25 (The following is the distribution but the total marks can vary depending on the length and complexity of the section.)

5 marks: all requested material provided

10 marks: clear explanation of included material, how obtained, all assumptions, thoughtful analysis. You are writing for an interested member of the public with a high school education.

5 marks: figures and tables are well used; good interaction in text.

5 marks: professional presentation style and tone; well-organized; reads like a report (not like answers to questions); references cited correctly.

## **Rubric for Final Report**

The final project grade is weighted as follows:

45%: The content, which will be graded following the same rubric as for individual sections.

45%: The done on improvements suggested during the assignments.

10%: the 'glue' holding the whole thing together: does it read like a coherent report?

Note that 45% of the grade comes from revisions based on past feedback: you could lose up to 45% if you do not revise past assignments.

## **Grading Policies**

Assignments: Failure to complete any one graded assignment will result in a failing grade for the quarter. If you are struggling to meet deadlines, please meet with the instructors or TAs so that we can work with you to find an alternate, acceptable schedule for completion.

Late Policy: Any late assignment or final project will be deducted 10% of the total possible marks for each calendar day it is late. But again, as said above, do contact us if there is a need to find an alternate, acceptable schedule for completion.

Attendance is essential, as one component of the course is learning from each other and gaining a perspective on the differences in the various counties in the Central Valley. In order to do this, obviously everyone needs to attend the classes. Therefore attendance is required; one "free-pass" allowed; after that the grade out of 10 received for Participation is decreased by 5 for each missed class, and can go into negative numbers. Of course, if there is a legitimate reason for missing class you will not be penalized, but you must let Prof. Knight know, if at all possible, before the start of class. If you know now of anticipated required absences, please discuss this with Prof. Knight now; it could be that you should not be taking this class.

## **Format of the Course**

Wednesday's class, in the form of a lecture, will be the start of the new topic for the following week. Either at the end of the Wed class, or at the start of the Friday class, we will introduce the new assignment for the following week and provide time for small-group discussions related to the topic. In the Friday class, we will be working on the assignments together. Work on the assignments will continue on Monday, with discussions designed to share and compare results.

## **The Honor Code**

Violating the Honor Code is a serious offense, even when the violation is unintentional. The Honor Code is available at:

<http://www.stanford.edu/dept/vpsa/judicialaffairs/guiding/honorcode.htm>. You are responsible for understanding the University rules regarding academic integrity; you should familiarize yourself with the code if you have not already done so. In brief, conduct prohibited by the Honor Code includes all forms of academic dishonesty, among them copying from another's exam, unpermitted collaboration and representing as one's own work the work of another. If you have any questions about these matters, see your TA during office hours.

## **Provost's Statement Concerning Students with Disabilities**

Students who have a disability which may necessitate an academic accommodation or the use of auxiliary aids and services in a class must initiate the request with the Office of Accessible

Education's Disability Resource Center (DRC). The DRC will evaluate the request with required documentation, recommend appropriate accommodations, and prepare a verification letter dated in the current academic term in which the request is being made. Please contact the DRC as soon as possible; timely notice is needed to arrange for appropriate accommodations (phone 723-1066; TDD 725-1067).

**FERPA:** Student Record Privacy Policy

<http://studentaffairs.stanford.edu/registrar/students/ferpa>

## **SCHEDULE OF ASSIGNMENTS AND OTHER REQUIRED MATERIALS**

All assignments will be distributed on Wednesday and are due at the start of class on the following Wednesday. Assignments will be graded and returned two days later, at the end of the Friday class. The final written project report is due at the start of class on March 9. The power point presentations will take place in class on March 9 and March 11, with presentations submitted at the start of class on March 9.

### **Project Description**

Produce a report describing the water budget for your county, covering topics associated with water quantity and quality. Most of the information you need will be found through government websites. The project report (~20 pages with figures) will be a detailed discussion of your data, your analysis, and your findings. The project report will be completed through a series of weekly assignments (which will be graded and returned for improvement). The final project is due at the start of class on March 9.

### **Assignments**

Distributed January 5 due January 12: Introduction to the study area, population.

Distributed January 12 due January 19: Precipitation (an important source of water)

(Jan 17 Martin Luther King, Jr. Day – no class)

Distributed January 19 due January 26: Landcover (impacts the movement of water)

Distributed January 26 due Feb 2: Groundwater storage (water below the ground surface)

Distributed Feb 2 due Feb 9: Surface water storage and deliveries

Distributed Feb 9 due Feb 16: Use of water (domestic, agricultural, industrial uses)

Distributed Feb 16 due Feb 23: Evapotranspiration (a significant loss of water)

(Feb 21 Presidents' Day – no class)

Distributed Feb 23 due March 2: Water quality (natural and human-related processes)

Distributed March 2: Box models of the water balance (assessing the present and future)

March 9 and 11: Final written project report due March 9. Power point presentation due. In class presentations March 9 and 11.