Water Resources Management
Environmental Systems 240
Spring 2019

Week	Date	Topic	Reading	In class	Homework
1 rb	1-23	Water Resources, water security, historical challenges	ICA 2012, UN 2013, Hanak ch1	discussion	
2 rb	1-30	Hydrologic context, California & western U.S.	CWP ch1.3, CWP highlights	discussion	HW1
3 rb	2-6	Water law, Water rights	WEF	analysis	HW2
4 rb	2-13	Water institutions – California, IRWM	CWP ch1.4	discussion	HW3
5 jm	2-20	Demand context, valuing water, agriculture, urban, environmental	Hanemann, Young ch 1-2	discussion	HW4
6 jm	2-27	Diversions, accounting, full natural flow, water information, modeling	Harou, Loucks	analysis	HW5
7 jm	3-6	Groundwater regulation, depletion, conjunctive use	Faunt, CWP V3 ch 9	Modeling	HW6
8 jm	3-13	Conservation, agriculture, urban, environmental, sustainability	CWP 3.3	modeling	HW7, paper topic
9 jm	3-20	Droughts, extent, climate context, adaptation	MacDonald, Lund	analysis	HW8
	3-27	Spring break			
10 jm	4-3	Sacramento-San Joaquin Delta	PPIC	analysis	HW9
11 rb	4-10	Hydropower, facilities, pumped storage, latitude of operation	various	modeling	HW10
12 rb	4-17	Floods & flood control, frequency, climate context	Lund, CVFMP	discussion	HW 11
13 rb	4-24	Natural capital, forest & watershed management	WRI	discussion	HW 12
14	5-1	Selected Topics and Course Review	TBD	students	–
15	5-8	Projects & discussion	none	students	–

Water Resources Management
Environmental Systems 240
Spring 2019
Course information

Context. Achieving a water-secure future requires strategic research to build the knowledge base for better water-resources management. Unprecedented climate change, population growth and changing landcover are radically altering the water cycle, with dramatic impacts on human and environmental uses of water. The main focus will be on California and the Western United States, with comparative analysis for other regions.

Format. Each weekly meeting is planned to include lecture, discussion and workshop components. Lecture materials will be posted before or after each class. Students are expected to ask questions, volunteer discussion, and comment on assigned reading. Students are also encouraged to bring additional ideas from other sources, which are relevant to the topic under study, to the class.

Course goal. This course will provide students a framework to address contemporary water resources problems, and to achieve water security for local areas and broader regions.

Course learning outcomes. Upon completion of this course, students will: i) be aware of critical water-resources issues at local, national and global scale, ii) have some depth of knowledge of water-resources issues facing California, and iii) be able to formulate solutions for water-resources problems.

Reading. Please read the papers and reports noted on the syllabus before class, and be prepared to discuss during class.

Homework. Assignments are due one week after being posted. Some longer assignments may be due 2 weeks after being assigned. See syllabus for sequencing of homework.

Object oriented programming. Some homework assignments will use object-oriented programming. We will also use this some during class. The open-source platform for this is Insightmaker. You can also use Stella; one can download a trial version, or purchase a student educational version at a discounted price.

Individual project. Each student will do a project paper and discussion on one topic of interest that they would like to pursue in more depth. A one-page proposal is due mid-way through the class, as noted on the syllabus. A final paper is due at the end of the class. Each student should also do a 10-minute presentation of the main points from the paper to the class.

Grading. Homework 40%; Project 40%; Participation 15%, Presentation 5%. All components are essential. The grading scale is determined by the students' performances (with A representing "excellent" work).

Academic integrity. Each student in this course is expected to abide by the University's Academic Honesty Policy. Any work submitted by a student in this course for academic credit will be the student's own work. You are encouraged to study together and to discuss information and concepts with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never

involve one student having possession of a copy of all or part of work done by someone else, in the form of an e mail, an e mail attachment file, a diskette, or a hard copy. Should copying occur, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the assignment. Penalty for violation of this Policy can also be extended to include failure of the course and University disciplinary action.

Accommodations for students with disabilities**.** University of California, Merced is committed to creating learning environments that are accessible to all. If you anticipate or experience physical or academic barriers based on a disability, please feel welcome to contact me privately so we can discuss options. In addition, please contact Student Accessibility Services (SAS) at (209) 228-6996 or disabilityservices@ucmerced.edu as soon as possible to explore reasonable accommodations. All accommodations must have prior approval from Student Accessibility Services on the basis of appropriate documentation.

If you anticipate or experience barriers due to pregnancy, temporary medical condition, or injury, please feel welcome to contact me so we can discuss options. You are encouraged to contact the Dean of Students for support and resources at (209) 228-3633 or https://studentaffairs.ucmerced.edu/dean-students.

Possible project topics. Pick something that you are interested in. It should be narrow enough that you can treat the subject in depth. Following are some examples of topics that could make a good individual project. Feel free to go outside the list for your topic, pending my approval.

- Sustainability and carbon footprint of storage options to offset loss of Sierra snowpack
- The definition and role of water balance California's Sustainable Groundwater Management Act
- Origins and solutions for a recent drought, e.g. South Africa
- Elements of long-term sustainable drought management in California
- Role of water footprinting in water resources management
- Elements of successful groundwater governance in semi-arid regions
- Potential for and constraints limiting water conservation in California agriculture
- Inter-annual water-storage potential in San Joaquin Valley, i.e. potential for development of water banks in selected river/groundwater basins
- Need and potential for natural-capital investments in California's headwaters
- Strategies for groundwater recharge in the Central Valley
- Robustness of infrastructure in the Sacramento-San Joaquin Delta
- Impact of forest thinning on water yield – water rights and institutional issues
- How data science can improve current water management of California
- Solutions to river-basin conflicts in one of the world's threatened and conflicted basins
- Successful strategies for whole-basin, integrated regional water management
- Soil salinity accumulation in the California Central Valley agricultural areas
- Managing Nitrate in groundwater to provide safe drinking water
- The California Water Fix
- Portfolio approaches for supplying water to agriculture

Format of project proposal. Write a one-half to one page project abstract or proposal, describing the topic and main questions that you propose, plus possible sources of information that will serve as a starting point for your project. Identify if you propose to use Stella for simulations or scenarios.

Format of project paper. The paper should include a brief introduction to the issue, topics and context, plus a clear statement of the questions posed. It should then develop the appropriate context needed to understand the topic, e.g. geographic, historical, climatic and socio-economic. It should analyze the problem or challenge and possible solutions. Consider infrastructure, institutions and also informational or other constraints to informed decision making. Length should be around 10 pages (1.5 line spacing), plus figures and at least 5 references from the peer-reviewed literature. Additional references can be from the grey literature. Please consult with instructor early in the process if you have questions.

Format of in-class presentation. Each student will give a 10-min presentation of their project. Use of slides to guide the audience and emphasize the main points is encouraged. Other students will be required to make anonymous written critique of presentation.