Overview of the Course:

This course will apply an interdisciplinary approach to the emerging challenge of freshwater availability, a topic of broad environmental and social significance as the world faces issues of sustainability in the 21st century. Conflicts over water have become more intense in the past several decades, with competing users vying for an adequate supply of water. Water is also critically linked to issues of energy consumption, climate change, and habitat degradation. This course will introduce students to this complex topic through the lenses of science and policy.

Students will begin the course by studying introductory concepts in hydrology and water resources, freshwater availability and use, and water development. Water quality issues will be covered as they relate to freshwater availability. U.S. Federal and local water resources policy will be covered, and two guest lectures will be given on water legal issues by attorneys with experience in U.S. water law.

The second half of the course will cover several special topics, including the water/energy nexus (including water supply and water contamination issues), the economics of water and privatization, conflicts among freshwater users and between freshwater supply and wildlife habitat preservation, and seawater and brackish water desalination. The course will end with two comprehensive case studies that illustrate the broad range of topics covered in the class: California freshwater supply and impacts of the recent drought, and an international case study of the Tibetan Plateau.

Several in-class and out-of-class assignments will be assigned throughout the course, with the objective of providing students applied experience in resolving multi-disciplinary water resources related problems.

Goals/Learning Outcomes for the Course:

- Demonstrate ability to analyze hydrologic and water supply data, including watershed delineations, groundwater flow mapping and quantification, groundwater contaminant plume mapping and wellhead protection areas, irrigation and municipal water demand requirements
- Develop a Watershed Management Plan, including reporting of water supply and demand, water quality issues, demographics/population, service area, per capita water use
- Identify and evaluate major water-resources related policy and law issues
• Develop brief case study narratives of water contamination issues, as demonstrated through energy/water nexus case study assignment
• Interpret and evaluate water-resource conflicts, including conflicts between freshwater supply and wildlife
• Critically evaluate water resource issues of specific geographic regions, including understanding impacts of regional/local climate and hydrology, demographics, land use and economy

Course Materials:


*California Dept. of Water Resources (DWR), 2015. Groundwater Sustainability Program DRAFT Strategic Plan, March 9 2015.


+ Available on ELMS-Canvas Course Reserves Section
*Available on ELMS-Canvas Files Section

Evaluation and Grading Criteria

A total of 100 points is possible from the following cumulative sources; (a) Mid-term test 25%; (b) Final examination 25%; (c) Student Presentation 15%; (d) Assignments 20%; (e) Final Paper 15%

Grades will be determined based on the following distribution: 100-98% = A+, 97-92 = A, 91-90 = A-; 89-88 = B+, 87-82 = B, 81-80 = B-; 79-78 = C+, 77-72 = C, 71-70 = C-; 69-68 = D+, 67-62= D, 61-60 = D-; ≤ 59 = F.
Course Policies

Late Policy
Unless you see me in advance of the due date and obtain an approved excuse, 5 percent of the total possible points will be deducted from your score for every day the assignment is late, including weekend days. (So, for example, on a 100-point scale, a student who would have earned a 94 on a timely paper will earn 89 if the same paper is turned in one date late, 84 if turned in 2 days late, etc.).

Attendance and Absences:
In accordance with University policy, students are expected to attend classes regularly and on-time. Attendance will not be taken on a regular basis, but failure to attend class is likely to impact your grade because the lecture materials will be a primary source of exam material.

An absence will only be considered excused under the circumstances described by the University’s attendance policy, available at: http://www.umd.edu/catalog/index.cfm/show/content.section/c/27/ss/1584/s/1540.

Academic Accommodations:
If you have a documented disability, please contact Disability Support Services 0126 Shoemaker Hall. Each semester students with documented disabilities should apply to DSS for accommodation request forms which you can provide to your instructors as proof of your eligibility for accommodations. The rules for eligibility and the types of accommodations a student may request can be reviewed on the DSS website at http://www.counseling.umd.edu/DSS. Please provide your documentation to me well in advance of any scheduled due dates or exams so that I can be sure that all of your accommodation needs are satisfied.

Religious Observances
The University System of Maryland policy provides that students should not be penalized because of observances of their religious beliefs. Students shall be given an opportunity, whenever feasible, to make up within a reasonable time any academic assignment that is missed due to individual participation in religious observances. It is the responsibility of the student to inform the instructor of any intended absences for religious observances in advance. Notice should be provided as soon as possible but no later than the end of the schedule adjustment (drop/add) period.

Code of Academic Integrity
Academic dishonesty (such as cheating on exams, plagiarism from the internet or other students, submitting the same paper for credit in two courses without authorization, buying papers, submitting fraudulent documents and forging signatures) is unacceptable and will result in referral to the Student Honor Council after which a determination of a violation will result in a failing grade in the course and a note on your transcript indicating a violation of the rules of academic integrity. The University’s Code of Academic Integrity sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student, you are responsible for upholding these standards for this course:

1. No cheating (“intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise”);
2. No fabrication (“intentional and unauthorized falsification or invention of any information or citation in an academic exercise”);
3. No facilitating academic dishonesty (“intentionally or knowingly helping or attempting to help another to violate any provision of this Code”);
4. No plagiarism (“intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise”).

For more information on the Code of Academic Integrity or the Student Honor Council, visit www.shc.umd.edu.

**Copyright Protection for Class Materials**

Commercial firms have been paying students to take notes and collect course materials, which are then copied and sold. Course materials that exist in a tangible medium, such as written or recorded lectures, Power Point presentations, handouts and tests, are copyright protected. Students **may not** copy and distribute such materials except for personal use and with the instructor's permission.

**Course Evaluation**

Your participation in the evaluation of courses through CourseEvalUM is a responsibility you hold as a student member of our academic community. Your feedback is confidential and important to the improvement of teaching and learning at the University. By completing all of your evaluations each semester, you will have the privilege of accessing online, at Testudo, the evaluation reports for the thousands of courses online at Testudo. Evaluations can be completed at www.courseevalum.umd.edu.
Schedule of Readings and Assignments:

Part I: Hydrology, Water Resources and Water Supply

Week 1 September 1/3. Introduction/Historical Perspective  
Reading: Cech, Chapters 1-2 (Optional: Chapter 2 Section – Climate and Weather)

Week 2 September 8/10. Hydrology and Water Resources  
Reading: Cech, Chapters 3-4 (Optional: Chapter 3 Sections - Flood Events, Transport and Deposition)  
September 10: Begin Assignment 1 (In-Class) Groundwater flow mapping

Week 3 September 15/17. Freshwater Availability and Use  
Reading: Alley et al., 2013; Hoekstra and Mekonnen, 2012  
September 17: Assignment 1 Due

Week 4 September 22/24. Water Development, Storage, Transport and Supply/Water Efficiency and Recycling  
Reading: Cech, Chapters 6-7  
September 24: Assignment 2 Due (Watershed Delineation Essay); Begin Assignment 3 (In-Class) Irrigation and Municipal Water Demand Requirements

Week 5 September 29/October 1. Water Quality and Water Resources  
Reading: Cech, Chapter 5, Chapter 11  
October 1: Assignment 3 Due; Begin Assignment 4 (In-Class) Groundwater Plume Mapping and Well-Head Protection Areas

Part II: Water Resources Policy and Law

Reading: Cech, Chapters 9-10  
Tuesday October 6: Student Presentation Topic Choices Due  
Thursday October 8: Assignment 4 Due

Week 7 October 13/15. U.S. Water Resources Law (Guest Lectures)  
Reading: Klein, Cheever and Birdsong, 2009. (Optional – Cech, Chapter 8).  
Tuesday October 13: Jayni Lanham, Beveridge & Diamond, P.C.  
Thursday October 15: Joanna Gogor, ENSP

Week 8 October 20/22. Mid-term Review and Mid-term

Part III: Water Resource Conflicts

Week 9 October 27/29. Water/Energy Nexus; Hydraulic Fracturing Case Studies  
Reading: USGS, 2015  
Tuesday October 27: Paper Assignment Topics Due

Week 10 November 3/5. Economics of Water, Privatization and the Human Right to Water  
Reading: Cech, Chapter 13; Gerlak and Wilder, 2012  
November 5: Assignment 5 Due - Water/Energy Nexus Case Study Essay
Week 11 November 10/12. Water, Fish and Wildlife (Student Presentations)
Reading: Cech, Chapter 12

Week 12 November 17/19. Water Use Conflicts (Student Presentations)
Reading: Cech, Chapter 14

Week 13 November 24. Seawater and Brackish Desalination
Reading: Cooley, Gleick, and Wolff, 2006
November 24 (Optional): Draft final papers due

Part IV: Water Resource Case Studies

Week 14 December 1/3. California Case Study
Reading: CA DWR, 2015; Steinbeck, 1952

Week 15 December 8/10. International Case Study (Tibetan Plateau) and Final Exam Review
Reading: Chellaney, Chapter 3
December 10: Final Papers Due