GEOG 553 Water Resources Management

Spring Semester, 2017
3 Credits
Thursdays 18:30-21:00
Room 2119 Wood Hall

Instructor: Professor Chansheng He
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Course Webpage: http://Elearning.wmich.edu/ for downloading class handouts

Office Hours: Mondays and Thursdays 15:00 - 17:00. Other times by appointment. Office hours may change under certain circumstances.

Purpose: The purpose of this course is to examine the principles, programs, and problems in water resource management from a watershed approach.

Objectives: The specific objectives of this course are to:

(1) Introduce students to the concepts, principles of and advances in watershed hydrology;

(2) Teach students the methods of estimating consumptive and nonconsumptive water uses;

(3) Apply hydrological principles and methods to analyze water quantity and quality issues and problems; and

(4) review, explore and synthesize paradigms, programs and alternative approaches such as Integrated Water Resources Management, Water Security and Watershed Science in water resources management.

Required Text Books:

Reference Books and Journals:


Water Resources Research
Journal of American Water Resources Association
Journal of Hydrology
Journal of Soil and Water Conservation
Hydrology and Earth System Science

WaterCulture.org
Global Environmental Change and Human Health –www.gechh.unu.edu
www.rivethreat.org – Key water indicators

Course Format: The course consists of lectures, discussions, assignments, and group projects. Students are required to actively participate and satisfactorily complete all the components. They are expected to complete the assigned readings before each lecture sessions so that they would be better prepared for class discussions which account for 5% of their final grade.

Grading Standard: Final grades of this course will be based on students' participation and performance in
class discussions, assignments, group project and presentation, and a mid-semester test. The weights are: 5% for participation in class discussions, 50% for assignments, 20% for project report, 5% for class presentation, and 20% for mid-semester test. Conversion of scores to final grade is based on: 91 or above = A, 86 - 90 = BA, 80 - 85 = CB, 70 - 75 = C, 66 - 69 = DC, 60 - 65 = D, below 60 = E.

**Standards for Submission of Written Materials:** Students are expected to complete their written assignments neatly and clearly on double-spaced computer printout using word processing. They should double-check the structure and grammar of their written materials before submitting them to the instructor.

In completing the written assignments, whether long or short, please include the following elements: 1) title, 2) introduction / background, 3) purpose of the paper (e.g. This paper addresses the environmental impact of human-induced climate change in the Great Lakes basin), 4) specific objectives (e.g. the paper evaluates impact of climate-change on lake level fluctuations), 5) point of view (literature review, different perspectives of environmental, manufacture, research, and governmental agencies), 6) data and information (e.g. references, tables, graphs, and maps), 7) theory and principles (ecology, hydrology, economics, etc.), 8) assumptions / standards (e.g. water and air quality standards), 9) implications and consequences (biological, physical, chemical, and economic, etc.), 10) specific interpretations or recommendations (no more than 2), and 11) subheadings of introduction, objectives, analysis, summary / recommendations, and references.

Always include a purpose statement in your paper. State your own suggestions clearly and elaborate on them with evidence (data or references) (answer: what, why, and how) and cite the sources of references in the text. It is always effective to use examples to support your point of view and demonstrate your understanding. Therefore, wherever appropriate, include examples in your writing.

Unless in unforeseeable emergency situation, students should submit their written assignments to the instructor by the due date. Late submission of the assignments will result in a grade deduction of 2 points per day.

**Academic Integrity.** You are responsible for making yourself aware of and understanding the policies and procedures in the [Undergraduate Catalog (pp.268-269)/Graduate Catalog (pp. 26-27)] that pertain to academic integrity. These policies include cheating, fabrication, falsification and forgery, multiple submission, plagiarism, complicity and computer misuse. If there is reason to believe you have been involved in academic dishonesty, you will be referred to the Office of Student Conduct. You will be given the opportunity to review the charge(s). If you believe you are not responsible, you will have the opportunity for a hearing. You should consult with me if you are uncertain about an issue of academic honesty prior to the submission of an assignment or test.

**Citation of literature in the text:** You may use any style guidelines adopted in your disciplines. Be sure to include author’s last name, and year in your citation, e.g. (Brown 1999). For more information, please refer to Turabian, K.L. 2013. A Manual for Writers of Term Papers, Theses, and Dissertations. 8th Edition. The University of Chicago Press, Chicago, Illinois. For Internet sources, please list the URL and the date you accessed it, e.g. www.epa.gov/nps, accessed Jan.7, 2003.

**Make-up Policy for Tests and Exams:** It is each student’s responsibility and choice to attend classes and complete the class assignments including tests on time. Students should notice that only under emergency conditions or advance notice with written evidence (e.g. a physician’s note or prescription, or a letter from an employer or a professor) can individuals be given make-up test or exam with the instructor’s approval. No make-ups will be given for the convenience of individuals for such excuses as vacationing, moving,
family gathering, and schedule conflicts, etc.

**Religious Tolerance Policy.** Students may be excused from class for the purpose of observing major religious holidays without penalty provided the student has made such a request in writing at least two weeks in advance to the instructor. Missed class time because of major religious observances does not excuse the student from class work or examinations. The student must provide the instructor with a two week formal, written request identifying how completion of the course work will be accomplished. The instructor will provide students making such written requests with a reasonable amount of time to make up the work missed in each class.

*A note on cellular phone use in the classroom:* Please turn off your cellular phones in the classroom to show respect to other students and to maintain the order of our lectures. Violation of this rule will subject one to being excluded from taking quizzes.

**Classroom Etiquette:** All students are required to adhere appropriate classroom etiquette to maintain an active learning environment. No eating in the classroom. Don’t put your legs on the table or desk. Be respectful to your peers in the classroom.

**Post and notification of grades.** The Family Educational Rights to Privacy Act prohibits post students’ grades by their names or any portion of their identification numbers/social security numbers without their written consent. Delivery of students’ grades via campus email or through the Internet is also prohibited. Confidentiality cannot be guaranteed. Thus I will not notify or deliver your grades via email, the Internet, or phone. Each student will be assigned a random 3-digit number that will be used to post the student’s grade.

**Email communication.** The only email address that should be used for communication between WMU students and WMU faculty and staff is the email address associated with a BroncoNet ID. This email address typically takes the form "firstname.middleinitial.lastname@wmich.edu." Please use appropriate etiquette including person's name and body of the text and greeting in email communications (just like you would write a letter to somebody). We should communicate professionally in both the digital world and real world. Each of us should treat others the same way we want to be treated.

Topics to be covered in this course:

01/12. Course overview, scope of water resource management, student background survey, water resource distribution and civilization, hydrologic cycle, and watershed definitions.

Reading: Textbook by Ward et al., pp. 1-34.

**Class presentations** are designed to help students improve their public speaking ability. Students may present the selected topics in groups of three. Each student should take this opportunity seriously and adequately prepare for his/her presentation. Formal dress is strongly encouraged. Presenters should carefully develop their visual materials such as PowerPoint presentation, transparencies, or maps. If possible, distribute your handouts to your classmates. Make sure your visuals can be clearly seen from the back seats of the classroom. Also list the sources of your references. Each group has 15-20 minutes of time for their presentation and another 5 minutes for questions and answers.

01/19. Estimating Precipitation in a Watershed: measurement methods – **Presentation No.1**; aggregation to watershed scale; source of data: remote sensing and in-situ measurements; algorithms and GIS procedures; limitations; and example.
Delineating Watershed Boundary by GIS
Reading: Textbook pp. 37-70.

01/26. Estimating Surface Runoff
Methods for Estimating Surface Runoff - Presentation No.2.
Reading: Textbook pp. 161-219; Class hand-out.
Assignment 1. Computing surface runoff - Due: 2/02.

02/02. Methods for Estimating Evapotranspiration (ET) Presentation No. 3. Assignment 1 due
A Case study of Saginaw Bay irrigation project
Reading: Textbook pp. 111-158; class handout.

02/09. Drought, Irrigation Demand, Municipal Water Supply and Demands. Assignment 2 due
Methods for Estimating Municipal Water Demands -Presentation No. 4.
Drinking Water Supply
Reading: class hand-out.

02/16. Infiltration and Soil Moisture
Groundwater and Wellhead Protection - Presentation No. 5.
Reading: Textbook pp. 73-108; Class Hand-Out
Video: Agriculture and ground water contamination: problems and prevention.

02/23. Water Quality: physical, chemical, and biological
Reading: Class handout.
Watershed Approach to Water Resource management
Indicators of Watershed Conditions; Data and Information; Case Studies: California's Imperial Valley, and the Three Gorges Dam Project in China.
Reading: National Research Council Textbook pp. 112-163.
EPA Video: Development of biological criteria. Economic considerations in water quality standards.
Assignment 3. Download and plot the Daily Statistics of discharge and water quality data, specific conductance (EC) and temperature) collected from the Kalamazoo River near Allegan Water Quality Site: 04107850 in a spreadsheet; compare those parameters and discuss likely causes for the temporal differences (for the period of 2001-06 to 2005-09) in these parameters (http://waterdata.usgs.gov/mi/nwis/monthly). Max. 3 pp. of text. Due: Mar.2.


03/09. Spring Break

03/16. Use of Simulation Models, Multiple Databases and GIS in Watershed Management
Total Maximum Daily Load (TMDL) - Computational Method
Reading: Class handout.
03/23. Visiting Kalamazoo Water Reclamation Plant, 5:30 - 8:00 p.m.

**Assignment 4.** Describe the purpose, methods/procedure, and performance of Kalamazoo Water Reclamation Plant facility. Discuss the role of waste treatment systems in water quality management. Min. 3 pp. **Due: Apr.6.**

03/30. **Mid-Semester Test.**

04/06. Measurement of Streamflow and water quality (field trip to Arcadia Creek at the intersection of Oliver Street and Railroad by the Student Recreation Center) **Assignment 4 due**

**Assignment 5.** Computing volume of streamflow and plotting water temperature, dissolved oxygen, pH, and electronic conductance - **Due: Apr.13.**


04/20. Climate Change and Water Resources. **Group Project Presentations.** Reading: Class handout.

04/27. Final Week. No final Exam. **Project Report Due by 5 p.m.**

It should be noted that the instructor reserves the right to change and modify the above schedule pertaining to the needs of the course.
GEOG 553 Group Project Guidelines

Group projects provide an opportunity to students for interactions, team work, and problem solving. Students are asked to select one of the topics listed below in a group of 2-3 people, conduct a literature review, and do some analysis, and develop a group project report. The purpose of this group project is for students to demonstrate their ability to apply the knowledge and skills they have learned from the class to addressing a real world problem. Suggested components in the group project report include:

1. Introduction to your topic (background) (4 points). What is your topic? Why do you select this topic? How serious is the problem(s) or how significant is the topic in water resources management or environmental protection?

2. Your objectives (3 points). What exactly do you want to do (be specific)? What issues are you going to address in your report?

3. Analysis (5 points). You should demonstrate, through analysis (computations, reasoning, literature review, or field survey, etc.) and/or evidence, the relationships between human activity and specific resource problems/issues, and propose appropriate alternatives or means for controlling the problems.

4. Summary and Suggestions (5 points). What are your findings? What have you learned through this project? What can be done about the problems?

5. References (3 points). (minimum 4 references)

Follow the commonly used guidelines such as that by Turabian to list the references you use in the report including the websites you visit. When you cite someone else’s work in the report, be sure to cite the author(s)’s name and year in the text. Similarly, if you list a website you have visited, add the date of your visit. Turabian’s reference book is listed below:


Pay attention to your organization, spelling, and grammar. Your report should be typed and double-spaced with one inch top, bottom, left, and right margins, respectively. For easy-reading, add sub-headings to your text. Your report should have a minimum length of 10 pages without counting the references.

You should turn in your report to me by Thursday, April 27, 5:00 p.m. Reports submitted later than this time would receive a deduction of 2 points per day toward your grade.

This year, instead of letting students choose their own projects, we will focus on the Kalamazoo River for the whole class. Each group will select a topic from the following list and in the end we will have a collection of consistent reports on the water resources of the Kalamazoo River. These reports will help each of us better understand the water resources problems and programs in the Kalamazoo River Watershed. They will also represent an important accomplishment in your program. Thus, we will distribute the presentation files and reports to each of you to be included in your resume or portfolio.

A list of the Kalamazoo River Watershed project topics:

1. Spatial distribution of monthly, seasonal, and annual precipitation in the Kalamazoo River Watershed
2. Frequency of floods and low flows in the Kalamazoo River Watershed
3. Identification of drought characteristics in Kalamazoo County
4. Water pollution by PCBs in the Kalamazoo River
5. Cleaning up PCBs by dredging of the Kalamazoo River
6. Nutrient loadings from the waste treatment plants in the Kalamazoo River
7. Changes of wetlands in the Kalamazoo River
8. Urban water demands in the Kalamazoo River
9. Tourism, recreation, and the Kalamazoo River
10. Agricultural irrigation demands in the Kalamazoo River Watershed
11. Spatial and temporal distribution of water resources in the Kalamazoo River Watershed
12. Paper mills (or industrial development) and the Kalamazoo River
13. Water use trends on Western Michigan University campus

Related web sites:
1. U.S. Geological Survey Water Data for the nation
   http://waterdata.usgs.gov/nwis - surface water, ground water and water quality
   Kalamazoo River Hydrologic Unit Code: 04050003
   Kalamazoo River near Allegan Water Quality Site: 04107850 for the period of 2001 to 2005
2. USGS Estimated use of water
3. USDA National Agricultural Statistics Service
   http://www.nass.usda.gov/
4. National Drought Mitigation Center
   http://drought.unl.edu
5. US Environmental Protection Agency WATERS
   http://www.epa.gov/waters
6. US EPA Surf Your Watershed
   http://cfpub.epa.gov/surf
7. US EPA STORET Legacy Data Center
   http://www.epa.gov/storpubl/legacy/gageway.html
   Other sites:
   Kalamazoo Gazette (www.mlive.com)
   NOAA Great Lakes Environmental Research Laboratory www.glerl.noaa.gov
   EPA Watershed Tools: http://www.epa.gov/OW/watershed/tools
   EPA WWW Server:http://www.epa.gov/
   EPA Great Lakes Areas of Concern: http://www.epa.gov/glhpo/aoc/kalriv.html
   EPA Nonpoint source site: http://www.epa/gov/OWOW
   Michigan Department of Environmental Quality www.michigan.gov/deq
   International Association for Great Lakes Research: http://www.iaglr.org
   The Journal of Environmental Planning and Management
   Journal of Great Lakes Research