GIS in Water Resources
Fall 2015

CE 394K.3	CEE 6440
University of Texas	Utah State University
Tue, Thur: 12:30-2 PM,	Tue: Thur, 11:30-1 PM, ENGR 401
ETC 5.148	Optional Lab Friday 11.30 to 12.30 ENGR 305
Unique Num: 15740	Catalog Number: 44334

Instructors:

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Office Hours: Tuesday - Thursday, 2PM - 3:30PM	http://www.neng.usu.edu/cee/faculty/dtarb/giswr/2015/
http://www.caee.utexas.edu/prof/maidment	Email: dtarb@usu.edu
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Course Description

Application of Geographic Information Systems in Water Resources. Digital mapping of water resources information. Spatial coordinate systems. Hydrologic terrain analysis using digital elevation models. River and watershed networks. Soil and land use mapping. Flood hydrology modeling and flood plain mapping. Integration of time series and geospatial data. Hydrologic modeling and Information Systems.

Prerequisites

Graduate standing in engineering or a related discipline.

Course Objectives

The five course exercises are intended to enable you to be able to:

- Plot a map of a hydrologic region including measurement sites and associate it with time series of data measured at those locations;
- Use web mapping to access geospatial and temporal water resources information;
- Create a base map of a study region including watersheds, streams, and aquifers by selecting features from regional maps;
- Interpolate measured data at points to form raster surfaces over a region, and spatially average those surfaces over polygons of interest;
- Do hydrologic calculations using map algebra on raster grids;
- Build a geometric network for streams and rivers;
- Analyze a digital elevation model of land surface terrain to derive watersheds and stream networks.
- Prepare a HEC-HMS hydrologic simulation model using geospatial services

Course Web Sites

University of Texas.

Public web site: http://www.caee.utexas.edu/prof/maidment/giswr2015/giswr2015.htm This contains the course outline, PowerPoint presentations, class exercises for the course and University of Texas specific information such as UT student work and term papers.
An archive of the video of each class in Windows Media format will be provided.

Utah State University.

Public web site: http://www.engineering.usu.edu/dtarb/giswr/2015 . This contains links to the course outline, PowerPoint presentations, class exercises and other USU specific information such as USU term paper and student work. The instructure site: https://usu.instructure.com/courses/388816 will be used to manage grades.

Method of Instruction

The course has six elements: lectures, assigned reading materials, homework exercises, a term paper, class interaction, and examinations. All students will prepare a term project in Adobe pdf format that will be posted on the course web site. Part of the final examination will involve synthesis of the term papers presented in the class to provide an assessment of the state of knowledge in particular subject areas. The course material is divided into modules with each module having one or two lectures and a homework exercise involving extensive use of GIS software.

Term Project

The purposes of the term project are:

1. To enable you to explore in-depth some aspect of the subject of personal interest to you and to develop experience in the use of GIS technology to solve that problem.
2. To provide experience in the formulation, execution and presentation of original research, including the proper documentation of a GIS project.
3. To make an oral presentation and produce a report in PDF on the world wide web that will be informative to you and to your classmates.

The steps in carrying out the project are:

1. Identify your course web page. At Texas, I will establish a class web page and put your materials on that. http://www.caee.utexas.edu/prof/maidment/giswr2015/giswr2015.htm At Utah State University we will use http://www.hydroshare.org to save term project material. See the website for instructions on doing this.
2. Prepare a 1-page proposal in PDF on your website by Thurs Sept 24 specifying the objective of your project and outlining how you plan to go about executing it. Notify the instructor by email that your proposal is available and you will receive a response by email containing an assessment of the scope of work that you propose. After making any revisions in your proposal that seem necessary in the light of this assessment, this proposal defines the scope of your term project. At Texas, you will submit your proposal using the Canvas system and the instructor will post it on the public web site for you.

You'll get comments back in the Canvas environment. At USU submit your proposal in HydroShare.

3. Prepare a two-page status report in PDF on your project to be posted on your website by Tues Oct 27. You are expected to make some progress by mid-semester but the main effort on your term project in the later part of the course once you've learned more about the methods in the course. This report will be read and commented on by the instructor, and perhaps other students. At Texas, this report should be submitted via Canvas. At USU submit your report in HydroShare.

4. Present a final report orally in class near the end of the semester (you will have 10 -12 minutes for your presentation) and present your term paper in PDF on your web page by December 4. It is critical that you post your paper by this date because your classmates may need to read your paper in order to complete their final exam.

If you would like to work in a group to pursue a term project, that is fine, but you must carry out a particular section of the project on which you will present your oral and written report. Generally team-based term projects are hard to unscramble at the end when it comes time to present the oral and written versions of your term project, so it is probably best to just do an individual term project.

Archives are available showing the reports from more than 500 term papers done by students in this course from Spring 1997 to last year. See:
http://www.caee.utexas.edu/prof/maidment/giswr2015/docs/termpaperlibrary.htm
http://www.engineering.usu.edu/dtarb/giswr/

Course Computer Environment

This course uses the ArcGIS version 10.3.1 software. The Spatial Analyst and 3D Analyst extensions of ArcGIS will also be used in the course. These programs run under the Windows operating system.

Texas. ArcGIS is available in the Civil Engineering Learning Resource Center. You may want to get a magnetic card so that you can enter the LRC in the evenings or weekends. If you work at the LRC, you'll be assigned a standard amount of disk space for your personal use. You will also be issued a license file to authenticate ArcGIS Desktop 10.3.1 operating on your own desktop computer.

Utah. ArcGIS is available in the Engineering PC lab, ENGR 305. You will also receive information about obtaining the student edition that you can use on your own computer.

If you have access to the software elsewhere, you can do the computer assignments at that location. You should plan to back up your work on a removable drive (e.g. zip or thumb) to avoid complications from lack of disk space in your personal area.

Course Readings

Readings for this course will be given out as in-class handouts, links to resources on the web, and written synopses of class lectures.

Method of Evaluation

Course grades will be based on a weighted average of results as follows:

Homework 20%
Term Project Written Report 30%
Term Project Oral Presentation 10%
Midterm Exam 20%
Final Exam 20%

The midterm exam will be an in class exam. The final exam will be a take home distributed in class on Thursday Dec 3 and due in a week later. Special arrangements for submitting the solution electronically for students travelling during that that week can be established. The final exam will include project type GIS analysis as well as essays and short reports that synthesize material from the class and from the term projects of other students in the class.

Letter grades will be assigned as follows:

A = 95 - 100%
A- = 90 - 95%
B+ = 87 - 90%
B = 83 - 87%
B- = 80 - 83%
C+ = 77 - 80%
C = 73 - 77%
C- = 70 - 73%
D+ = 65 - 70%
D = 60 - 65%
F < 60%

There will be no make-up exams or incomplete grades in this course. We reserve the right to change the date of an exam with notice in advance. Class attendance will not be recorded in this class and will not form part of the criteria for establishing grades. All lectures are videotaped and the lecture can be viewed from the archive whose web address is given elsewhere in this syllabus.

Course/Instructor Evaluation Plan
Course/Instructor evaluation will be conducted separately at each University according to the policies of each University.
Texas. The electronic form for Course Instructor Evaluation will be used.
Utah. USU will use the IDEA system for student evaluations. You will receive email from the university with instructions for how to fill out evaluations online.

We also encourage students to speak to us during the semester, and are open to suggestions relating to the course.

Students with Disabilities
Texas. The University of Texas at Austin provides upon request appropriate academic accommodations for qualified students with disabilities.   For more information, contact the Division of Diversity and Community Engagement, Services for Students with Disabilities, (512) 471-6259 (voice) or (512) 410-6644 (video phone) or http://www.utexas.edu/diversity/ddce/ssd Utah. Students with ADA-documented physical, sensory, emotional or medical impairments may be eligible for reasonable accommodations. Veterans may also be eligible for services. All accommodations are coordinated through the Disability Resource Center (DRC) in Room 101 of the University Inn, (435)797-2444 voice, (435)797-0740 TTY, or toll free at 1-800-259-2966. Please contact the DRC as early in the semester as possible. Alternate format materials (Braille, large print or digital) are available with advance notice.

Course Drop Policies
University of Texas
From the 1st through the 4th class day, graduate students can drop a course via the web and receive a refund. During the 5th through 12th class day, graduate students must initiate drops in the department that offers the course and receive a refund. After the 12th class day, no refund is given. No class can be added after the 12th class day. From the 13th through the 20th class day, an automatic Q is assigned with approval from the Graduate Advisor and the Graduate Dean. From the 21st class day through the last class day, graduate students can drop a class with permission from the instructor, Graduate Advisor, and the Graduate Dean. **Students with 20-hr/week GRA/TA appointment or a fellowship may not drop below 9 hours.**

Utah State University
The USU registration calendar at http://catalog.usu.edu/ gives the deadlines for dropping, dropping without notation on your transcript and receiving a refund.

Schedule

Class	Date	Subject	Lecturer
1	Thu, Aug 27	Introduction to ArcGIS.	Maidment
2	Tue, Sep 1	Introduction to GIS in Water Resources. Review the course curriculum, course outline.	Tarboton
3	Thu, Sep 3	Exercise 1: Introduction to ArcGIS	Tarboton
4	Tue, Sep 8	Data sources for GIS in water resources	Maidment
5	Thu, Sep 10	Exercise 2: Building a base map	Maidment
6	Tue, Sep 15	Geodesy, map projections and coordinate systems	Maidment
7	Thu, Sep 17	Spatial analysis using grids	Tarboton
8	Tue, Sep 22	Exercise 3: Spatial analysis in hydrology	Tarboton
9	Thu, Sep 24	Digital Elevation Based Watershed and Stream Network Delineation. *1 page Term project proposal due*	Tarboton
10	Tue, Sep 29	Terrain Analysis Using Digital Elevation Models (TauDEM).	Tarboton
11	Thu, Oct 1	Exercise 4: Watershed and Stream Network Delineation.	Tarboton
12	Tue, Oct 6	National Flood Interoperability Experiment	Maidment
13	Thu, Oct 8	Review for Midterm Exam.	Maidment
14	Tue, Oct 13	Midterm Exam	All
15	Thu, Oct 15	Arc Hydro for Groundwater [USU Fall Break, class optional for USU students]	Maidment
16	Tue, Oct 20	HEC-HMS hydrologic modeling	Maidment
17	Thu, Oct 22	Extending ArcGIS using programming.	Tarboton
18	Tue, Oct 27	Exercise 5: Building an HEC-HMS hydrologic model using geospatial services *2 page term project status report due*	Tarboton Maidment
19	Thu, Oct 29	Flood mapping	Maidment
20	Tue, Nov 3	LIDAR	Maidment
21	Thu, Nov 5	Hydrologic Information Systems and HydroShare	Tarboton
22	Tue, Nov 10	Texas Student Presentations	Maidment
23	Thu, Nov 12	Texas Student Presentations	Maidment
24	Tue, Nov 17	Texas Student Presentations	Maidment
25	Thu, Nov 19	Texas Student Presentations	Maidment
26	Tue, Nov 24	Texas Student Presentations	Maidment
	Thu, Nov 26	Thanksgiving	
27	Tue, Dec 1	Utah Student Presentations	Tarboton
28	Thu, Dec 3	Utah Student Presentations	Tarboton
	Fri, Dec 4	*Term project due*	