GIS in Water Resources
Fall 2010

CE 394K.3	**CEE 6440**	**CIVE 898**
University of Texas Tue- Thur, 12:30-2 PM ETC 5.148 Unique Number: 15745	Utah State University Tue- Thur, 11:30-1 PM ENGR 401 Optional Lab Friday 11.30 to 12.30 ENGR 305 Catalog Number: 41625	University of Nebraska-Lincoln Tue- Thur, 12:30-2 PM 128 Mabel Lee Hall (City campus)

Instructors:

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Course Description

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

Prerequisites

Graduate standing in engineering or a related discipline.

Course Objectives

The six 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;
- Develop a Hydrologic Information System that links time series of water observations to locations where the measurements are made
- 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;
- Apply the Arc Hydro data model to a set of streams, watersheds, water bodies, monitoring points and time series of information measured at those points;
- Analyze a digital elevation model of land surface terrain to derive watersheds and stream networks;
- Use remote sensing information in ArcGIS

Course Web Sites

University of Texas.

Public web site: http://www.ce.utexas.edu/prof/maidment/giswr2010/giswr2010.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.

Video web site: http://coe-jaguar.engr.utexas.edu/mediasite/Catalog/pages/catalog.aspx?catalogId=f647a6a2-5cf1-4afc-a7f9-f783c9c11436. This contains an archive of the video of each class in Windows Media format.

Utah State University.

http://www.engineering.usu.edu/dtarb/giswr/2010. This contains copies of the course outline, PowerPoint presentations, class exercises, and other USU specific information such as USU term paper and student work.

University of Nebraska-Lincoln

http://snr.unl.edu/airmak/giswr/2010/ This website contains copies of the course outline, PowerPoint presentations and class exercises, archived presentations from each class in Macromedia Breeze format, and other UNL specific information such as UNL term paper and student work.

Method of Instruction

The course has six elements: lectures, assigned reading materials, homework exercises, a term paper, class interaction, and examinations. All students will have a web page where they will post their term paper proposal and final term paper. 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 html on the world wide web that will be informative to you and to your classmates.

The steps in carrying out the project are:

1. Establish a web page. At Texas, if you don't already have a personal web page, establish one at the University of Texas Webspace http://www.utexas.edu/its/services/webpub/ . At Utah a web page will be established for you on the CEE Server for the Geomatics lab. See the USU class web site for instructions on accessing this. At UNL a web page will be established for you. See the UNL class web site for instructions on accessing this.
2. Prepare a 1-page proposal in html on your website by Thurs Sept 30 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.
3. Prepare a 2 page status report on your project to be posted on your website by Thurs Oct 21. 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.
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 html on your web page by the last day of classes (Dec 3). 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.

Archives are available showing the reports from more than 200 term papers done by students in this course from Spring 1997 to last year. See:
http://www.ce.utexas.edu/prof/maidment/giswr2010/docs/termpaperlibrary.htm
http://www.engineering.usu.edu/dtarb/giswr/
http://snr.unl.edu/airmak/giswr/index.htm

Course Computer Environment

This course uses the ArcGIS version 10 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.

Utah. ArcGIS is available in the Engineering PC lab, ENGR 305.

Nebraska: ArcGIS is available in the Teaching Lab (room 141 and 142) and 24/7 computer lab (Rm 162) at Hardin Hall at East Campus. **The software is also available at Engineering Lab in Nebraska Hall (City Campus).**

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

The readings for this course will be taken from: "Arc Hydro: GIS for Water Resources" Ed by David R. Maidment, published by ESRI Press, 2002, $59.95 ISBN 1-58948-034-1, see http://gis.esri.com/esripress/display/index.cfm It is not required that you purchase this book.

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 exam handed out during the last class and due 1 week after the last class. This 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%
C- = 60 – 70%
F < 60%

There will be no make-up exams or incomplete grades in this course. We reserve the right to change the date of a quiz with notice in advance. The final exam will be a take home distributed in class on Thursday Dec 2 and due in a week later. Special arrangements for submitting the solution electronically for students travelling during that that week can be established. 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. Forms will be distributed during the final lecture period. A student from the class will be asked to distribute and collect the evaluation forms, and to return them to the Department of Civil Engineering office on the 4th floor of ECJ.
Utah. A secretary from the CEE department will conduct the course evaluation during one of the final lecture periods with the instructor not present.
Nebraska. UNL students are not going to use paper-based evaluation forms. Rather, students will receive an email with a link to evaluation website. In addition, there is going to be a link to evaluation website via blackboard.

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, 471-6259 (voice) or 232-2937 (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.
Nebraska: The University of Nebraska provides upon request appropriate adjustments for qualified students with disabilities. For more information, 132 Canfield Administration Building or contact the Office of the Dean of Students at 472-3787.

Course Drop Policy at 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.**

Class Schedule

Class	Day and Date	Subject	Lecturer
1	Thu, Aug 26	Introduction to GIS in Water Resources. Review the course curriculum, course outline. *Optional for USU Students.*	Maidment
2	Tue, Aug 31	Introduction to ArcGIS.	Maidment
3	Thu, Sep 02	Exercise 1: Introduction to ArcGIS	Maidment
4	Tue, Sep 07	Data sources for GIS in water resources	Maidment
5	Thu, Sep 09	Exercise 2: Building a base map	Maidment
6	Tue, Sep 14	Geodesy, map projections and coordinate systems	Maidment
7	Thu, Sep 16	Spatial analysis using grids	Tarboton
8	Tue, Sep 21	Exercise 3: Spatial analysis in hydrology	Tarboton
9	Thu, Sep 23	Digital Elevation Based Watershed and Stream Network Delineation.	Tarboton
10	Tue, Sep 28	Exercise 4: Watershed and Stream Network Delineation.	Tarboton
11	Thu, Sep 30	Network analysis, Arc Hydro, and NHDPlus *Term project proposals due - posted on your web site*	Maidment
12	Tue, Oct 05	Exercise 5: Arc Hydro and NHDPlus	Maidment
13	Thu, Oct 07	*Review*	Maidment
14	Tue, Oct 12	*Midterm Exam*	All
15	Thu, Oct 14	Arc Hydro for Groundwater	Maidment
16	Tue, Oct 19	Arc Hydro for Groundwater	Maidment
17	Thu, Oct 21	Imagery and Remote Sensing *Term project status report due - posted on your web site.*	Irmak
18	Tue, Oct 26	Exercise 6: Use of Remote Sensing data in ArcGIS	Irmak
19	Thu, Oct 28	GIS Data Sharing and ArcGIS Online	Maidment
20	Tue, Nov 02	Lidar measurement of land surface terrain	Maidment
21	Thu, Nov 04	Measuring information using autonomous airborne vehicles	Tarboton
22	Tue, Nov 09	Hydrologic Information Systems	Maidment
23	Thu, Nov 11	HydroServer - a platform for sharing hydrologic data	Tarboton
24	Tue, Nov 16	Presentation of Term Papers	Students
	Thu, Nov 18	Presentation of Term Papers	Students
25	Tue, Nov 23	Presentation of Term Papers	Students
26	Thu, Nov 25	*Thanksgiving!!*	
27	Tue, Nov 30	Presentation of Term Papers	Students
28	Thu, Dec 02	Presentation of Term Papers, Course evaluation, discussion of final exam	Students