GEOG / WILD 1800:
Introduction to Geographic Information Science

Fall 2015 Syllabus

PROFESSOR

Dr. Peter Howe
Email: peter.howe@usu.edu
Office: Natural Resources (NR) 218
Office hours: Wednesday 1 – 3 pm or by appointment

LAB INSTRUCTOR

Shannon Belmont
Email: swb.in.ut@gmail.com
Office: Natural Resources NR 138
Office hours by appointment

UNDERGRADUATE TEACHING FELLOW

Tim Beach
Email: timbeach17@gmail.com
Tutoring hours in the Quinney Library by appointment

LECTURES

Veterinary Science Bacteriology (VSB) 130
Monday, Wednesday, & Friday, 9:30–10:20 am

LABS

Quinney Library (QLIB)
Section 501: Wed, 10:30–11:45 am (QLIB 304)
Section 503: Thu, 1:30–2:45 pm (QLIB (306)
Section 504: Fri, 1:30–2:45 pm (QLIB 306)

Course description

Geographic Information *Systems* (or GIS) refers to the technology used to capture, manage, analyze, and display geographically referenced information. Geographically referenced information is simply information about *where* something is and *what* is there. GIS technology is increasingly used in a wide range of fields. Some examples include environmental modeling, facilities management, social and demographic change analyses, urban planning, homeland security, economic development, site suitability analyses, marketing, transport routing, and web design.

Geographic Information *Science* (or GIScience) is the science behind the technology. GIScience studies the underlying theory and building blocks of GIS. GIScientists work to improve knowledge about GIS, its applications, and to address fundamental questions that GIS raises for society.

This course will introduce the fundamental concepts of both geographic information systems and science, including geographic data, mapping, geospatial analysis, and geospatial technologies. The course involves both lectures and hands-on lab activities using ESRI ArcGIS, the most widely used commercial GIS software package.

While students will gain a working knowledge of ArcGIS, the focus of the course is on analytical concepts that are fundamental in any GIS environment. After the successful completion of the course, students should:

1. Understand basic concepts and terminology of geographic data, spatial analysis, geospatial technologies, and cartography
2. Develop skills in the operation of GIS software

3. Be able to formulate a research question and implement analytical steps to answer the question using GIS
4. Know how to find and use resources, including sources of geospatial data, to answer questions and solve problems

PREREQUISITES AND EXPECTATIONS

There are no prerequisites for this course, but you should be familiar with the Windows operating system and be able to perform basic tasks such as copying files and folders, editing documents and spreadsheets, navigating websites, and using search engines and online mapping tools (such as Google Maps).

As with any university-level course, an understanding of basic mathematics and statistics is required. You will be expected to write professionally with proper spelling and grammar. All secondary sources must be properly cited and referenced.

Course materials

REQUIRED TEXT

Bolstad, Paul. 2012. *GIS Fundamentals: A First Text on Geographic Information Systems*. Fourth Edition. Eider Press. (Book available at the USU campus store or online).

Additional readings are available on Canvas (see course schedule).

USB DRIVE

A USB drive is recommended for backing up your data in the labs.

CANVAS

We will use Canvas (usu.instructure.com) throughout the course for announcements, submitting assignments, online discussions, and grade reporting. It is your responsibility to use the Canvas system. Questions about Canvas can be directed to the USU IT service desk (it.usu.edu, servicedesk@usu.edu, 435-797-4357).

COMPUTER HARDWARE AND SOFTWARE

A personal computer is not required for this course. Lab assignments will be based on ArcGIS version 10.3, which is available on all lab computers as well as the workstations in the Quinney Library (http://www.cnr.usu.edu/quinney/htm/labs) and in the Engineering computer lab ((http://engineering.usu.edu/htm/resources/open-access-pc-lab).

A 1-year ArcGIS student license is available for students who wish to use ArcGIS on their own computers. Please contact the lab instructor via email (swb.in.ut@gmail.com) or Canvas for a digital download key. Note that ArcGIS is only compatible with the Windows operating system. If you have a Mac, you will need to install Boot Camp or a virtual Windows machine such as Parallels, Virtual Box, or VMware.

Students are strongly urged to back up their data often during the semester. The Quinney computers save all data and files students download to the lab's server. Therefore the student's data and settings are downloaded to any Quinney computer to which the student logs on. Note again that it is the student's responsibility to back up their data; there is no guarantee that the student's data and settings will be protected.

Course structure

LECTURES

The class will meet three times a week for lecture sessions. The lectures will include a presentation on the topic for that day, and there may also be hands-on exercises, quzzes, and small group activities to demonstrate GIS principles. The lecture is intended to be an interactive environment. Participation is essential to your learning in this course.

READINGS

Readings will be assigned for each week of lecture sessions. It is your responsibility to complete the readings listed on the course schedule *before* coming to class.

LABS

Attending lab sessions and completing lab assignments is a requirement of this course. See section "Labs" below for more details.

QUIZZES

There will be unannounced quizzes during lecture sessions that will make up part of your participation grade. Quizzes may cover material from previous lectures, labs, and reading assignments. The lowest two quiz grades (including missed quizzes) will be dropped when calculating your final grade.

EXAMS

There will be two exams: a mid-term exam during class on Friday, Oct. 23, and a final exam during finals period on Wednesday, Dec. 16 from 9:30 to 11:30 am. Exams will cover material from lectures, readings, and labs and will include a combination of multiple choice and short answer questions.

FINAL LAB PROJECT

In the final lab project you will have the opportunity to showcase the skills and concepts you have learned during the semester. Unlike the lab assignments for which detailed instructions are provided, the final project will be mostly self-directed. The final project is due on Friday, December 11 by midnight.

GRADING SCALE

Grade	A	A–	B+	B	B–	C+	C	C–	D+	D	F
%	93-100	90-92	87-89	82-86	80-81	77-79	72-76	68-71	64-67	60-63	< 60

RUBRIC

Students will be responsible for the following work:

	Percent of grade
Lab assignments (10 total)	50%
Final project	10%
Participation (incl. in-class quizzes)	10%
Mid-term exam	15%
Final exam	15%
	100%

Labs

Each student must be enrolled in a lab session. The lab is intended to provide time for hands-on experience working with GIS software. The lab instructor will start the lab with a brief introduction, including an overview of the learning objectives, materials, and expected deliverables. Students will have the remainder of the lab to work individually or in groups. The lab instructor will rotate around the classroom helping those students who require assistance. For most labs, students will be required to work outside of lab period to complete the assignment.

LAB ATTENDANCE

The lab portion of this course is critical. Lab attendance is not mandatory, but you cannot learn GIS by only attending the lecture. You are welcome to attend a different lab section any week that you miss a lab or if you need some extra help completing an assignment.

LAB ASSIGNMENTS

There will be 10 lab assignments. Lab exercises have been written with the intent of exposing you to the fundamental tools of ArcGIS, teaching you to think and problem solve spatially, and to be resourceful when troubleshooting problems. Assignment types will vary depending on the week and subject matter being covered; however, assignments will generally require some research, time in the lab, and information portrayed in your own words. Lab assignments will be introduced each week in lab; written instructions and data files are posted on Canvas. Due dates depend on your individual lab section and are posted on Canvas. As a general rule each assignment will be due the following week before the start of lab.

The lab schedule is aggressive and unrelenting. Lab exercises will not always be finished within the lab period. Late assignments will be penalized according to the late work policy for the course (below). However, it is better to turn labs in late rather than not turn them in at all. Each lab exercise builds on knowledge and skills acquired in previous assignments. Assignments get progressively more complex and instructions become less detailed throughout the semester. You cannot afford to get behind.

Students will submit most lab exercises in digital form to Canvas (with the exception of the first lab). Individual feedback will be provided on Canvas; individual comments will be provided on the grading rubric associated with each exercise. The feedback provided is designed in part to help the student improve their cartography and presentation style, which is a critical component of effectively presenting GIS results.

Lab assignments will be graded not only on provided the "correct" answers, but also on your ability to clearly and professionally express information through text and graphics.

LAB GRADING

Grading rubrics for each lab can be found under the individual assignment page on Canvas. Specific grading criteria are listed with the associated points each criteria is worth. If you do what is asked of you on each assignment, you will meet expectations and can expect to get a B. To get an A, your submissions will need to be exceptional. More information and details about grading will be available in lab.

Course policies

ATTENDANCE AND PARTICIPATION

Attending each lecture and lab session is necessary to achieve a satisfactory grade in this course. If you miss class, do not e-mail the instructor to ask what you missed. It is your responsibility to obtain materials or notes from other students and Canvas.

LATE WORK AND MAKE-UP EXAMS

It is your responsibility to turn in all work on time. Grades for assignments will be reduced by 10 percent for each day late. No late work will be accepted more than 2 weeks after the due date.

No make-up exams or quizzes will be offered unless prearranged with the instructor or as a result of a documented emergency.

USE OF COMPUTERS, TABLETS, AND MOBILE PHONES

Turn off or silence phones during class. Computers and tablets may be used only for taking notes or activities directly relevant to lecture material during class. Students should respect the rights of others to learn and minimize the possibility of distraction from the use of electronic devices. If your use of electronics presents a distraction to others during class, you will be asked to stop using the device. If issues persist, you will be asked to leave the class.

ACADEMIC HONESTY

Students are expected to produce original work. Plagiarism or falsification of any kind will be subject to disciplinary action. Offences will be referred to Utah State University Admissions office. The USU policy for academic honesty can be found at: usu.edu/studentservices/studentcode/article6.cfm. Please review this document to understand the Utah State University policy on academic honesty. If you have questions or concerns about the policy, please contact your instructor or academic advisor.

PLAGIARISM

Plagiarism includes knowingly "representing, by paraphrase or direct quotation, the published or unpublished work of another person as one's own in any academic exercise or activity without full and clear acknowledgment. It also includes the unacknowledged used of materials prepared by another person or agency engaged in the selling of term papers or other academic materials." The penalties for plagiarism are severe. They include warning or reprimand, grade adjustment, probation, suspension, expulsion, withholding of transcripts, and denial or revocation of degrees.

STUDENTS WITH DISABILITIES

Reasonable accommodation will be provided for all persons with disabilities in order to ensure equal participation within the program. If a student has a disability that will require some accommodation by the instructor, the student must contact the Disability Resource Center (435-797-2444), preferably during the first week of the course. Any request for special consideration relating to attendance, pedagogy, taking of examinations, etc., must be discussed with and approved by the instructor.

Course schedule

Your learning is my primary concern, so I may modify the schedule and assigned readings based on your progress during the course. Any changes will be announced in class and posted on CANVAS.

Date			Week	Lecture topic	Required reading	Lab topic
Aug	31	M	1	Introduction to GIS & GIS applications	Bolstad ch. 1	Lab orientation and start Lab 1
Sep	2	W				
	4	F				
	7	M	2	NO CLASS (Labor Day)	Bolstad ch. 2	Lab 1: Hands-on GIS concepts
	9	W		The nature of geographic information: GIS data models		
	11	F				
	14	M	3	Map projections and coordinate systems	Bolstad ch. 3	Lab 2: Intro to ArcGIS & basic cartography (lab 1 due)
	16	W				
	18	F				
	21	M	4	Maps, data entry, and editing	Bolstad ch. 4	Lab 3 Understanding spatial data types (lab 2 due)
	23	W				
	25	F				
	28	M	5	Geographic information technologies (GPS and field data collection)	Bolstad ch. 5	Lab 4: Coordinate systems (lab 3 due)
	30	W				
Oct	2	F				
	5	M	6	Data management (attributes, tables, databases), Joining and relating data, spatial queries	Bolstad ch. 8	Lab 5: Collecting your own data via GPS (lab 5 due)
	7	W				
	9	F				
	12	M	7	Spatial analysis of vector and raster data	Bolstad ch. 9	No labs this week (lab 6 due)
	14	W				
	15	Th		NO LECTURE TODAY		
	19	M	8	Spatial analysis (cont'd)	Review for midterm	Lab 6: Digitizing day on campus
	21	W				
	23	F		**Midterm exam** (in class)		
	26	M	9	Remote sensing	Bolstad ch. 10	Lab 7: Vector geoprocessing of traffic violations (lab 6 due)
	28	W				
	30	F				
Nov	2	M	10	Terrain analysis	Bolstad ch. 11	Lab 8: Raster-based terrain analysis (lab 7 due)
	4	W				
	6	F				
	9	M	11	Spatial statistics (cont'd) and GIS programming	Bolstad ch. 12 excerpts (p. 473-486 & 499-502)	Lab 9: Spatial statistics with social media data (lab 8 due)
	11	W				
	13	F				
	16	M	12	Advanced cartography and geovisualization	Online readings: see Canvas	Lab 10: Habitat suitability modeling—Yurt lab (lab 9 due)
	18	W				
	20	F				
	23	M	13	NO LECTURE TODAY	No readings this week	No labs this week
	25	W		NO CLASS (Thanksgiving Break)		
	27	F		NO CLASS (Thanksgiving Break)		
	30	M	14	Data standards and quality	Bolstad ch. 14	Work on final project (lab 10 due)
Dec	2	W				
	4	F		NO LECTURE TODAY (use time to finish final project)		
	7	M	15	The future of geographic information science	Bolstad ch. 15	Finish final project (due Fri, Dec. 11 by midnight)
	9	W				
	11	F		NO LECTURE TODAY (use time to finish final project)		
	16	W		**Final exam**, 9:30 – 11:20 am		