GEOG / WILD 1800:
Introduction to Geographic Information Science

Fall 2016 Syllabus

PROFESSOR
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Office hours: Tuesday 1-3 pm or by appointment

UNDERGRADUATE TEACHING FELLOW
Logan Christian
Email: logchristian@gmail.com
Tutoring hours Wednesday 1:30-2:30 (or by appointment) in the Quinney Library Computer Labs

LECTURES
Veterinary Science Bacteriology (VSB) 130
First six weeks of semester
Monday, Wednesday, & Friday, 9:30–10:20 am
Remainder of semester
Monday & Wednesday, 9:30-10:20 am

LABS
Quinney Library (QLIB)
Section 501: Wed, 10:30–11:45 am (QLIB 304)
Section 502: Thu, 1:30–2:45 pm (QLIB 306)
Section 503: Fri, 1:30–2:45 pm (QLIB 306)

COURSE FEE
The course fee of $75 is used to provide software and support in the GIS computer labs and access to ArcGIS student licenses for use on personal computers.

Course description
Geographic Information Systems (or GIS) is the technology used to capture, manage, analyze, and display geographic information. Geographic information is simply information about where something is and what is there—information with a location. GIS technology is used in many different fields. Examples include urban planning, wildlife science, epidemiology, climate science, geology, social science, environmental engineering, homeland security, transportation planning, and many more.

Geographic Information Science (or GIScience) is the science behind the technology of Geographic Information Systems. 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

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

USB DRIVE
Students will need a USB drive to store data and map documents in the computer 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, but one can be useful. Lab assignments will be based on ArcGIS version 10.4, which is available on all lab computers as well as the workstations in the Quinney Library (http://qcnr.usu.edu/college/about_us/quinney_computer_lab) and in the Engineering computer lab (https://engineering.usu.edu/students/open-access-computer-labs/).

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, Vmware, or Virtual Box.

Students are strongly urged to save and back up their data often during the semester. The Quinney computers do not save data or files between sessions. Therefore students must save their maps and
data to a personal USB drive if they wish to retain these files. Note again that it is the student’s responsibility to back up their data; there is no guarantee that the student’s data will be protected.

Course structure

LECTURES
The class will meet three times a week (M,W,F) for lecture sessions for the first six weeks of the semester. For the remainder of the semester the class will meet twice a week (M,W). The lectures will include a presentation on the topic for that day, and there may also be hands-on exercises, quizzes, 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
Students will take exams in the USU Testing Center. There will be two exams: a mid-term exam the week of October 24, and a final exam during finals period. 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 9 by midnight.

GRADING SCALE

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<thead>
<tr>
<th>Grade</th>
<th>A</th>
<th>A−</th>
<th>B+</th>
<th>B</th>
<th>B−</th>
<th>C+</th>
<th>C</th>
<th>C−</th>
<th>D+</th>
<th>D</th>
<th>F</th>
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<tr>
<td>%</td>
<td>94</td>
<td>90</td>
<td>87</td>
<td>86</td>
<td>84</td>
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<td>79</td>
<td>77</td>
<td>76</td>
<td>73</td>
<td>67</td>
</tr>
</tbody>
</table>

RUBRIC
Students will be responsible for the following work:

<table>
<thead>
<tr>
<th>Percent of grade</th>
<th>Lab assignments (12 total)</th>
<th>Lab journal</th>
<th>Final project</th>
<th>Participation (incl. in-class quizzes)</th>
<th>Mid-term exam</th>
<th>Final exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>50%</td>
<td>5%</td>
<td>10%</td>
<td>10%</td>
<td>12.5%</td>
<td>12.5%</td>
</tr>
</tbody>
</table>
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 also be required to work outside of lab period to complete the assignment.

LAB ATTENDANCE

The lab portion of this course is critical. You cannot learn GIS by only attending the lecture. You may attend a different lab section any week that you miss a lab or if you need some extra help completing an assignment, as long as there are enough computers for students who are registered for that section.

LAB JOURNAL

The goal of the lab journal is to enhance critical thinking & problem solving skills through active personal reflection as you develop a practical understanding of GIS concepts, techniques, and real world applications. This journal is a place to practice asking better questions, explore mistakes made in previous labs, consider how to build better maps for a specific purpose in a creative fashion, and increase the employability of your methods. Students will be expected to sketch a flowchart of the procedures they use in each lab and to answer the weekly lab journal questions, which will be written on the board at the beginning of each lab session. Lab journals will be collected periodically throughout the semester, but will need to be completed during each lab.

LAB ASSIGNMENTS

There will be 12 lab assignments. Lab exercises have been written to introduce 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 registered 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 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. 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 providing 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 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.

<table>
<thead>
<tr>
<th>Date</th>
<th>Week</th>
<th>Lecture topic</th>
<th>Required reading</th>
<th>Lab topic</th>
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</thead>
<tbody>
<tr>
<td>Aug</td>
<td>29 M</td>
<td>Introduction to GIS &amp; GIS applications</td>
<td>Bolstad ch. 1</td>
<td>Lab 1: Intro to ArcGIS and basic cartography</td>
</tr>
<tr>
<td>Sep</td>
<td>31 W</td>
<td>NO CLASS (Labor Day)</td>
<td>Bolstad ch. 2</td>
<td>Lab 2: Ins and Outs of spatial data (lab 1 due)</td>
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<td></td>
<td>2 F</td>
<td>The nature of geographic information: GIS data models</td>
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<td></td>
<td>5 M</td>
<td>Map projections and coordinate systems</td>
<td>Bolstad ch. 3</td>
<td>Lab 3: Intro to coordinate systems (lab 2 due &amp; journals collected)</td>
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<tr>
<td></td>
<td>7 W</td>
<td>Maps, data entry, and editing</td>
<td>Bolstad ch. 4</td>
<td>Lab 4: Coordinate system analysis with migration data (lab 3 due)</td>
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<tr>
<td></td>
<td>12 M</td>
<td>Geographic information technologies (GPS and field data collection)</td>
<td>Bolstad ch. 5</td>
<td>Lab 5: GPS data collection (lab 4 due)</td>
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<tr>
<td>Oct</td>
<td>14 W</td>
<td>Data management (attributes, tables, databases), Joining and relating data, spatial queries</td>
<td>Bolstad ch. 6</td>
<td>Lab 6: Digitizing data (lab 5 due &amp; journals collected)</td>
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<td></td>
<td>16 F</td>
<td>Spatial analysis of vector and raster data</td>
<td>Bolstad ch. 7</td>
<td>Lab 7: Geoprocessing (lab 6 due)</td>
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<td></td>
<td>19 M</td>
<td>NO LECTURE</td>
<td>Review for midterm</td>
<td>Lab 8: Fix This Map exercise (lab 7 due)</td>
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<td></td>
<td>21 W</td>
<td>NO LECTURE (Fall break)</td>
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<td></td>
<td>26 W</td>
<td>Midterm exam: schedule your exam in the testing center Monday, Tuesday, or Wednesday. NO LECTURES THIS WEEK.</td>
<td>Bolstad ch. 9</td>
<td>Lab 9: Freestyle GIS exercise (lab 8 due)</td>
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<tr>
<td>Nov</td>
<td>28 F</td>
<td>Advanced raster and terrain analysis</td>
<td>Bolstad ch. 10</td>
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<td>31 M</td>
<td>NO LECTURE</td>
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<td>3 W</td>
<td>Spatial statistics and network analysis</td>
<td>Bolstad ch. 11</td>
<td>Lab 10: Raster-based terrain analysis (lab 9 due &amp; journals collected)</td>
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<td>4 F</td>
<td>NO LECTURE</td>
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<td></td>
<td>7 M</td>
<td>Cartography and geovisualization</td>
<td>Bolstad ch. 12 excerpts (p. 473-486 &amp; 499-502)</td>
<td>Lab 11: Spatial statistics with Twitter data (lab 10 due)</td>
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<td>9 W</td>
<td>NO LECTURE</td>
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<td>11 F</td>
<td>Cartography and geovisualization</td>
<td>Online readings: see Canvas</td>
<td>Lab 12: Suitability modeling—Suitability modeling—Yurt lab (lab 11 due)</td>
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<td></td>
<td>14 M</td>
<td>Data sources and standards, intro to GIS programming</td>
<td>Bolstad ch. 13</td>
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<td>16 W</td>
<td>NO LECTURE</td>
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<td>18 F</td>
<td>NO LECTURE</td>
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<td>21 W</td>
<td>Cartography and geovisualization</td>
<td>Online readings: see Canvas</td>
<td>No labs this week</td>
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<td></td>
<td>23 W</td>
<td>NO CLASS (Thanksgiving Break)</td>
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<td></td>
<td>25 F</td>
<td>NO CLASS (Thanksgiving Break)</td>
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<tr>
<td></td>
<td>28 M</td>
<td>Data sources and standards, intro to GIS programming</td>
<td>Bolstad ch. 14</td>
<td>Work on final project (lab 12 due &amp; journals collected)</td>
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<tr>
<td>Dec</td>
<td>30 W</td>
<td>NO LECTURE</td>
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<tr>
<td></td>
<td>2 F</td>
<td>Cartography and geovisualization</td>
<td>Online readings: see Canvas</td>
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<td>5 M</td>
<td>NO LECTURE</td>
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<td></td>
<td>7 W</td>
<td>NO CLASS (Thanksgiving Break)</td>
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<td></td>
<td>9 F</td>
<td>NO LECTURE</td>
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<td></td>
<td>12 M</td>
<td>Final exam: schedule your exam in the testing center Monday or Tuesday of Finals Week.</td>
<td>Bolstad ch. 15</td>
<td>Finish final project (due Fri, Dec. 9)</td>
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