Advanced GIS

WATS 6915 - GIS Fundamentals (1 cr, 5 wks)
WATS 4930/6920 - Advanced GIS & Spatial Analyses (3 cr, 10 wks)
WATS 4931/6921 - GIS Research Project (2 cr, 5 wks)

Lecture: Tu/Th 10:30 – 11:45 NR 105
Instructor: Shannon Belmont
Office: NR 138
Phone: 435-797-9480

Labs:
T (501) 12-2 LSB 225
Th (502) 12-2 LSB 225
F (503) 10:30-12:30 LSB 225
shannon.belmont@usu.edu

Course Descriptions

WATS 6915 is the first five weeks of the semester. The course is targeted at graduate students who want a crash course or refresher in GIS, but don't have the time or need for the full 10 week course. No prior GIS experience is necessary, but the pace is rapid. It is perfect for someone wanting to know how to make effective maps for their thesis or dissertation, as well as an introduction to data acquisition and creation as well as basic spatial analyses using vector and raster data.

WATS 4930/6920 is what you should take if you want to get a comprehensive understanding of GIS and advanced spatial analyses. GEOG 1800 is a prerequisite for WATS 4930. Builds proficiency in geoprocessing in GIS to solve spatial problems. Topics include data acquisition, georeferencing, advanced vector & raster analyses, surface interpolation, DEM construction, morphometric analysis, exposure to ArcGIS geostatistics tools, modeling in ArcGIS, geoprocessing, and error assessment.

WATS 4931/6921 is a five week follow up to WATS 4930/6920, which puts the skills and principles learned in Advanced GIS & Spatial Analyses into practice through individual student research projects. WATS 4930 is available for capstone credit to Watershed Sciences students. Students will prepare a poster to present in a poster session and a mock manuscript for potential publication.

Course Objectives

This course is designed to help students:

- Build a strong understanding of the fundamental theories of geographic information science behind Geographic Information Systems (GIS), and in so doing build an awareness of what GIS can and cannot be used for.
• Become proficient in the use of GIS tools to conduct spatial analyses and build maps that are fit-for-purpose and effectively convey the information for which they are intended.
• Build confidence in teaching yourself how to undertake new analyses (unfamiliar to you) using GIS, troubleshooting problems in GIS, and seeking help from the GIS community to solve your problems.
• Use GIS analyses to address applied problems and/or research questions.
• Become effective in building maps that can be shared with non-GIS users (e.g. PDF maps and interactive web maps).

<table>
<thead>
<tr>
<th>Learning Outcome:</th>
<th>WATS 4930/6920</th>
<th>WATS 4931/6921</th>
<th>WATS 6915</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - GIS Theory</td>
<td>partial</td>
<td>NA</td>
<td>Core</td>
</tr>
<tr>
<td>2 - Proficiency in Spatial Analyses &amp; Cartography</td>
<td>Core</td>
<td>Partial</td>
<td>Partial</td>
</tr>
<tr>
<td>3 - Self-Teaching &amp; Troubleshooting</td>
<td>Partial</td>
<td>Core</td>
<td>Partial</td>
</tr>
<tr>
<td>4 - Spatial Analysis in Research</td>
<td>NA</td>
<td>Core</td>
<td>NA</td>
</tr>
<tr>
<td>5 - Communicating with GIS</td>
<td>partial</td>
<td>Core</td>
<td>partial</td>
</tr>
</tbody>
</table>

**Course Materials**

**Canvas:** The course will use Canvas (https://online.usu.edu/) for course announcements, assignment delivery and submission, discussions, grades, etc. It is the student’s responsibility to log in to and utilize the Canvas system. Help using the Canvas system can be obtained by contacting USU Information Technologies at 797-HELP or going to http://it.usu.edu.

**Software:** The ESRI education edition software package (a one year free trial of ArcGIS 10) will be made available to all students enrolled in the class.

**Hardware:** Students will have access to the Life Science Building classroom computers as well as the Quinney Library computer labs which both run ArcMap 10.6. You are absolutely welcome to use your own computer for the course. Please see: http://desktop.arcgis.com/en/system-requirements/latest/arcgis-engine-system-requirements.htm for more information or to test your computer for compatibility with ArcGIS.

**Note:** ArcMap will NOT run on an apple operating system.
Over the years, students who are dealing with computer issues after the start of the semester fall behind and have a very difficult time catching up.

No Required Textbook

Suggested texts:

  This is a very approachable text on the principles underlying GIS.

  This book is a thorough ‘recipe’ style GIS workbook. Includes data disk.

Course Structure

The course will be a mix of lecture, discussion, and hands-on labs.

Lecture

In general, I will try to make the lectures as interactive as possible. The first 5 weeks will have lectures Tuesday and Thursday to cover (and review) fundamental GIS concepts and theories. Lectures in the second 5 weeks will taper off and will focus on a few current and relevant issues in GIS. WATS 4931/6921 will include discussions of scholarly literature and current research, but will remain intensively work driven. Recorded lectures from Spring 2012 are available online under each Course Lecture Topic on the gis.joewheaton.org website for later viewing or in case you miss a lecture. There will be periodic quizzes in lecture to reinforce the key topics. Tuesdays will include an introduction to the lab material, special notes, hints and suggestions. This introduction will not be repeated in the lab sessions.

Lab

Labs will typically start with a brief question and answer session. The bulk of the lab will be spent doing hands on lab assignments and projects using desktop ArcGIS. Attendance at labs is not mandatory. Everything you need to complete the labs is online in the lab assignment pages on Canvas or on gis.joewheaton.org. Assignments will be submitted via Canvas.

However, the labs serve the following important functions:

- They provide you with a physical location and computer on which to do the GIS lab assignments (note that ArcGIS is provided for free and you can do the assignments on your own computer with Windows).
- They provide an opportunity for you to get one-on-one help from the instructor, get help from your peers, and give help to your peers (an important learning process).
- The lab introduction is a great opportunity to get tips on the lab assignment and feedback on past lab assignments.

If you need help, come to lab.

Lab exercises have been written such that the first lab will help reacquaint students with the functionality of ArcMap while building professional cartographic skills. The labs will cover new topics each week and will build proficiency using fundamental tools. The pace of the class is rigorous in that students need to complete one lab assignment per week of the semester. This is not a self-paced course.

Late work will be covered below. But let it be known that the instructor really hates grading late labs. Late labs take 2-3 times longer to grade which is horribly inefficient. The instructor will be crabby and unforgiving of the smallest errors that you should have had time to deal with given the extra time you took to get the assignment in. Additionally, if you submit an ArcMap project (*.mxd) you will receive zero points for the assignment.

Reading assignments (periodic) are designed to inspire, foster discussion, and expose students to contemporary GIS applications in various natural resource fields as well as cover the critical fundamentals.

Discussions: WATS 6920 students will have the opportunity to find, read, analyze, summarize, and present one published article concerning the novel use of GIS tools and analyses. These presentations will occur during weeks 5-10.

Students are expected to interact with each other and with the instructor in class and in lab. Students are invited to help each other work through encountered ‘problems’ to further promote GIS problem solving. But all coursework is individual!

Work load: I’m not going to lie; this course will be a lot of work. You should expect to spend at least 10 hours per week (or maybe substantially more) on the assignments each week.

Course assessment: Assessment of the class will occur during week 15 utilizing the IDEA course assessment tool.
Grading

The primary goal for the course is that you engage in achieving the learning objectives. In other words, learn GIS, become confident in your ability to troubleshoot issues and evaluate your results, become a proficient presenter of GIS results. Your grade is a secondary concern. If you are effectively learning, your qualitative success is almost certainly guaranteed and ‘quantitative’ success should naturally follow. However, here are some guidelines to help manage your expectations and work load:

**WATS 6915**

- 5 Lab Reports 95%
- 2 quizzes 5%

**WATS 4930**

- 9 Lab Reports 95%
- Occasional Quizzes 5%

**WATS 6920**

- 9 Lab Reports 90%
- Occasional Quizzes 5%
- Presentation 5%

**WATS 4931/6921**

Your grade consists entirely of individual project-based work:

- Proposal, 3 Vignettes and Peer Review 20%
- Poster Presentation 20%
- Final Report 60%

Utah State University Grading Scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (93-100%)</td>
<td>B+ (87-89%)</td>
</tr>
<tr>
<td>A- (90-92%)</td>
<td>B (83-86%)</td>
</tr>
<tr>
<td>B- (80-82%)</td>
<td>C (73-76%)</td>
</tr>
<tr>
<td>C- (70-72%)</td>
<td>D (60-69%)</td>
</tr>
<tr>
<td>F (Below 60%)</td>
<td></td>
</tr>
</tbody>
</table>
Quizzes (5% of final grade)

There will be a few pop-quiz activities in lecture. The format of these quizzes will vary widely, but most are designed to help you gauge your own knowledge and assess where you are at with respect to the lecture material and readings. There will not be makeup quizzes. If you miss a quiz due to a pre-excused absence, you can get a pass. If you miss a quiz due to any other reason that was not cleared prior to the absence, you are out of luck.

Communication

I will be available via email to answer any questions or to clarify issues that arise throughout the semester. Email is a faster mode of communication than Canvas and I will make strong efforts to respond to students as quickly as possible. Canvas will be utilized for class-wide announcements and addressing frequently asked questions. Students are expected to monitor email and Canvas in order to receive communications about the class in a timely manner. Individual and specific feedback will be provided on Canvas.

Policies

Late work. Any work submitted 1 day past the due date will receive an automatic 10% reduction unless due to a pre-approved excused absence. 20% will be deducted over the next few days based on communication (or lack of) between student and instructor. Partial credit can be received for work turned in late assuming the student has sought approval from the instructor. No work will be accepted more than two weeks after the original deadline regardless of the circumstances.

Let yourself be reminded: I really hate grading late labs. Late labs take 2-3 times longer to grade which is unacceptably inefficient. The instructor will be crabby and unforgiving of the smallest errors.

If you submit an ArcMap project (*.mxd) you will receive zero points for the assignment. Some leniency may be shown to the Fundamentals of GIS (6915) students, but no mercy will be shown to the Advanced GIS (4930/6920).

Labs will not be accepted if they are more than 2 weeks late. “Late” includes (but is not limited to):
• labs that have been uploaded to your website “on time” but no URL was submitted to Canvas (the instructor does not sit around monitoring your websites for activity and the instructor is not clairvoyant);
• labs that have been emailed to the instructor. Emailed labs don’t count as submissions.

Submit your work (6915) or URL (4930/6920) to Canvas every week.

**Ok, now for the serious stuff:**

I am not here to evaluate how clever you are at looking things up on the internet. I am here to teach you GIS theory and skills. I am here to evaluate your understanding of GIS theory and skills.

This class has been publishing their results on Google sites for YEARS. This means there is a wealth of readily accessible material out there for you to find. Good for you that you have ways of evaluating yourself and your results.

However, if you feel compelled to take any of this material and submit it as your own work you will fail this course and you will be reported to the University’s office of student conduct. Is that clear enough?

Here are the supporting details:

**Working together.** You are welcome and expected to discuss lab exercises and help each other overcome obstacles encountered. Please take advantage of the external class forum whenever possible to view questions and answers previously posted about the lab work. **However**, each student must undertake their own analyses, make their own maps, produce their own figures and prepare their own websites and reports.

**Plagiarism will not be tolerated.** Copying figures or text without appropriate citations or permission will not be tolerated. Instances of plagiarism will be reported to the University. If you are unaware of the University’s three strike policy, you can read about it at:

http://catalog.usu.edu/content.php?catoid=12&navoid=3140

**Honor Pledge:** Students will be held accountable to the Honor Pledge, which they have agreed to: “I pledge, on my honor, to conduct myself with the foremost level of academic integrity.”

**Academic Dishonesty:** Don’t cheat. The Instructor of this course will take appropriate
actions in response to Academic Dishonesty, as defined the University’s Student Code:

Acts of academic dishonesty include but are not limited to:

1. Cheating: (1) using or attempting to use or providing others with any unauthorized assistance in taking quizzes, tests, examinations, or in any other academic exercise or activity, including working in a group when the instructor has designated that the quiz, test, examination, or any other academic exercise or activity be done “individually”; (2) depending on the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments; (3) substituting for another student, or permitting another student to substitute for oneself, in taking an examination or preparing academic work; (4) acquiring tests or other academic material belonging to a faculty member, staff member, or another student without express permission; (5) continuing to write after time has been called on a quiz, test, examination, or any other academic exercise or activity; (6) submitting substantially the same work for credit in more than one class, except with prior approval of the instructor; or (7) engaging in any form of research fraud.

2. Falsification: altering or fabricating any information or citation in an academic exercise or activity.

3. Plagiarism: 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 using materials prepared by another person or by an agency engaged in the sale of term papers or other academic materials.

This instructor highly values the University’s Academic Code of Conduct and the integrity of this course. Plagiarism will not be tolerated in this course. I recommend that you clearly cite all sources referenced in any part of the work you submit for this course. Give full credit to the original source (person or entity) for any ideas, thoughts, phrases (reworded or not), or data that you use, in part or in whole.

Full text of the Student Code available at available at available at http://www.usu.edu/studentservices/pdf/StudentCode.pdf:

Special needs: 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, (435)797-2444 VP, 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.