Geog 381/Plan 381: Advanced Geographic Information Systems (Winter 2018)

Instructor: Peter Johnson
Associate Professor, Department of Geography and Environmental Management,

Meeting Time: 11:30 am - 2:20 pm Tuesday Physics 235

Lab: Galileo Lab EV1 240
Lab 101: 10:30-12:20 Monday
Lab 102: 10:30-12:20 Wednesday
Lab 103: 4:30-6:20 Friday

Office Hours: Wednesday 1pm to 3pm, or by appointment (EV1-236)
If you need to schedule an appointment outside of these hours, please contact me.

E-mail: peter.johnson@uwaterloo.ca
From Monday to Friday, I make every effort to answer emails within 24hrs. Email sent on the weekend will normally be answered on the following Monday. Please note that I only discuss grading issues during office hours.

TA: TBA

Course Description

This course blends traditional GIS lab assignments with a problem-based approach to learning organized around five assignments. Lab assignments focus on the introduction of students to advanced functions of GIS, including automation through model building and scripting. Each assignment will be focused on solving a real-world problem using GIS. There is no single 'correct' answer, but rather, students will be required to think creatively, build on topics taught in class and data provided, and develop an appropriate solution using GIS. This format is intended to mirror how GIS is often used in the working world - where solutions are not prescribed, but rather, created.

The course builds on the knowledge and skills developed in GEOG/PLAN 281 and focuses on using GIS to perform selected types of spatial analyses. Students will learn how to perform different types of spatial analyses, identify the types of questions different analysis approaches can answer, critically evaluate the advantages and limitations of different approaches, and gain a better understanding of the use of capabilities of spatial analysis.

***Please note:** In GEOG 381, creative problem solving and experimentation will be rewarded. Data provided for each case study and techniques that are introduced in class should be considered as a starting point only. To achieve an excellent mark, you will need to move beyond these or implement them in some unique way.

Course Objectives

By the end of the course, students should be able to:

1. Choose an *appropriate* analytic approach and methods to study a given geospatial problem
2. Demonstrate awareness and mastery of key techniques of geospatial analysis using desktop GIS software and methods of extending GIS, including model building and scripting
3. Critically evaluate the use of geospatial tools as they are applied to geospatial problems
4. Develop the problem solving skills required to *independently* extend desktop GIS functionality to address novel situations and challenges in spatial analysis

Evaluation

This course will mix lecture-style delivery of content with laboratory assignments, each designed to support the development of technical skills.

Assessment

Assignment #1 – Mapping Crime Occurrence   15%
Assignment #2 – Model Builder and Python   15%
Assignment #3 – Using Python to Scrape Twitter   20%
Assignment #4 – Network Analyst   25%
Assignment #5 – Multicriteria Analysis   25%

Administrative:

Deadlines
Assignments are due on the date specified at the top of the assignment handout.

Unclaimed assignments: Unclaimed assignments will be retained for one term after the course is finished. After that time, they will be destroyed in compliance with UW's confidential shredding procedures.

Religious Observances: Student needs to inform the instructor at the beginning of term if special accommodation needs to be made for religious observances that are not otherwise accounted for in the scheduling of classes and assignments.

LEARN: Users can login to LEARN via:http://learn.uwaterloo.ca/ use your WatIAM/Quest username and password. LEARN is an essential component of this course, so please be sure to login for course updates and information. The PowerPoint files are provided to simplify the note taking process and to ensure that diagrams are copied correctly. **I will add many details during class, including explaining diagrams, images, and concepts.** You are responsible for all materials presented in lecture.

Textbook: There is no assigned textbook for this course.

Lecture and Lab Schedule (subject to changes)

Geog 381/Plan 381: Advanced Geographic Information Systems (Winter 2018)

Date	Lecture Topics	Lab Activity
Week #1 January 9	L01 - Course introduction, expectations, syllabus, and introduction to spatial analysis - ArcGIS refresh - Data gathering, management, structuring, georeferencing	No labs
Week #2 January 16	L02 – Point analysis + clusters Introduction to Assignment #1	
Week #3 January 23	L03 - Model Builder - What is a model? - Automation benefits incl. working with ArcGIS Model Builder	Assignment #1 due before class
Week #4 January 30	L04 - Python Syntax and structure as applied to ArcGIS Introduction to Assignment #2	
Week #5 Feb 6	L05 – Introduction to Twitter API, web maps and mapping	Assignment #2 due before class
Week #6 Feb 13	Introduction to Assignment #3	
Week #7 Feb 20	Reading Week	
Week #8 Feb 27	L06 - Networks and ArcGIS Network Analyst Tutorial - Weighting methods and ranking options Assignment #4 Introduction	Assignment #3 due before class
Week #9 March 6	Networks and ArcGIS Network Analyst Tutorial	

Week #10 March 13	L07 – Multi-Criteria Evaluation/ Site selection Assignment #5 Introduction	Assignment #4 Due
Week #11 March 20		
Week #12 March 27		
Week #13 April 3		Assignment #5 Due

EXTREMELY IMPORTANT INFORMATIONPLEASE READ THIS***

Accommodations and Access: I want this class to be open and accessible to everyone, and to be a safe, welcoming, and collegial environment. So, please feel free to sit where you like, eat snacks, use a laptop, and come and go from the classroom when you need to, so long as none of these activities disturb the learning experience of other students. I recognize that classroom learning can be challenging, and I will try and reduce barriers to access in general and also work to meet any specific accommodation needs you may have. You can approach me directly, after class, in my office hours, or via email to discuss any accommodation. Some specific accommodations, such as note taking, extended test writing times, learning technology support, and other can be arranged at the AccessAbility office (located in Needles Hall, Room 1132, (https://uwaterloo.ca/disability-services/)). Please register with this office at the beginning of each academic term.

Mental Health: Pretty much every student has or will face some type of mental health challenge in their time at university. There are many types of physical and emotional challenges that can make it difficult to do your best work and enjoy your studies. **You are not alone, and help is available from many different places**. If you need help, go immediately to the place you feel most comfortable; your residence don, your friends, your professors (including me!), or to Counselling Services http://www.uwaterloo.ca/counselling-services, located on the 2nd floor of the new Needles Hall expansion. Counselling Services is an inclusive, non-judgmental, and confidential space for anyone to seek support. They offer confidential counselling for a variety of areas including anxiety, stress management, depression, grief, substance use, sexuality, relationship issues, and much more. Above all, seek help – these are challenges that you do not need to face alone.

Academic Integrity Policies

Academic Integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check www.uwaterloo.ca/academicintegrity/.]

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4, www.adm.uwaterloo.ca/infosec/Policies/policy70.htm. When in doubt please be certain to contact the department's administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity [check www.uwaterloo.ca/academicintegrity/] to avoid committing an academic offence, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate Associate Dean. For information on categories of offences and types of penalties, students should refer to Policy 71, Student Discipline, www.adm.uwaterloo.ca/infosec/Policies/policy71.htm. For typical penalties check Guidelines for the Assessment of Penalties, www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm.

Within ENV, those committing academic offences (e.g. cheating, plagiarism) will be placed on disciplinary probation and will be subject to penalties which may include a grade of 0 on affected course elements, 0 on the course, suspension, and expulsion.

Appeals: A decision made or penalty imposed under Policy 70 (Student Petitions and Grievances) (other than a petition) or Policy 71 (Student Discipline) may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72 (Student Appeals) www.adm.uwaterloo.ca/infosec/Policies/policy72.htm.

What does a grade mean? Students come to the University of Waterloo from a variety of backgrounds, where numeric grades may not be used, or have very different meanings. The following table gives a general definition for what type of work constitutes a particular grade. Please note that very good quality work typically merits a grade of between 70-79, with grades of over 80 being reserved for truly exceptional work.

Assigned Grades	Description
80-100	Grades in this category signal a sign of excellence and are not something that should be expected for work that simply meets the requirements of the assignment. In this category, a student has demonstrated a full understanding of the subject matter, has capacity to analyze, has demonstrated critical thinking, shows evidence of creative thinking, familiarity with literature and previous work in area, highly developed communication and presentation skills. The work is of outstanding quality according to the criteria established for evaluation.
70-79	Student has shown good comprehension of subject matter, evidence of critical and creative thought, familiarity with literature and previous work in subject area, competence in communication and presentation skills, but none of the above to the degree found in A category. The work is of very good quality according to evaluation criteria
60-69	Student has demonstrated some understanding of subject matter, can assimilate and communicate basic aspects of the subject matter. The work is of satisfactory or adequate quality according to evaluation criteria
50-59	Student has demonstrated minimal understanding of the subject matter, poorly developed communication skills, inability to apply subject matter understanding in other contexts, little evidence of critical or creative thinking. The work is of unsatisfactory but passable quality according to evaluation criteria.
0-49	Inadequate understanding of subject matter, failed to complete course requirements, no demonstration of critical thought, communication skills very poor. The work is clearly of unacceptable quality according to the evaluation criteria.