Geog 381/Plan 381: Advanced GIS (Winter 2021)

Instructor: Grant Gunn, Assistant Professor, Dept. of Geography and Env. Management

Meets: Lectures/Labs delivered online (COVID Response: normally delivered in person).

Lab: Labs will be conducted online using UWaterloo's Virtual Desktop Infrastructure

TAs: Natalija Nikolic (n2nikoli@uwaterloo.ca) – Responsible for Lab 101 (Last name A – L)
Braeden Kearns (b2kearns@uwaterloo.ca) – Responsible for Lab 102 (Last name M – Z)

Office Hours:

Grant Gunn -	Monday 2:00PM – 4:00PM, or by appointment
Natalija Nikolic –	Wednesdays 12:00PM – 2:00PM
Braeden Kearns –	Fridays 1:00PM – 3:00PM

To schedule an appointment outside of these hours, please contact the professor.

E-mail: g2gunn@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.

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. This course uses **ArcMap** software. 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.

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

Assessment

Assignment #1 – Mapping Crime Occurrence	10%
Assignment #2 – Georeferencing address data	10%

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Assignment #3 – Using *Python* to scrape and visualize sports	15%
Assignment #4 – Network Analyst	15%
Assignment #5 – Multicriteria Analysis	20%
Final Test	30%

Lab Assignments:

You may be wondering why you are still assigned a specific lab section since the course is online. We are going to be assigning specified due "days" for each lab section in an attempt to ensure that the virtual desktop resources are not overloaded (resulting in programs hanging or crashing and losing work). Therefore, your assignment due date depends on the lab section that you are enrolled in (listed below):

Lab Section	**Assignment Due Date**
Lab 101	Thursdays
Lab 102	Fridays

For example: If you are in Lab section 101, you will submit your assignment to Dropbox by 11:55pm on the Thursday of the week that the assignment is due.

Schedule (subject to changes)

The course comprises power point "lectures" with additional notes provided to students. The lectures will be delivered by a mix of Powerpoint with notes, voice over Powerpoint, and screen video capture of tutorials/methods for you to use when you are completing labs. The schedule of course content and deliverables is subject to change. Additional tutorials or workshops may be added to the course to facilitate knowledge transfer and completion of labs. If a change or addition occurs then an updated version of this course outline will be posted on the course LEARN website.

Date	**Lecture Topics**	**Lab Activity**
Week #1 January 11	L01 - Course introduction, expectations, syllabus	No labs
Week #2 January 18	L02 – Data management and workflows, choropleth mapping with hexagons, point analysis + clusters Introduction to Assignment #1	Assignment #1 Mapping Crime Occurrences
Week #3 January 25	L03 – Geocoding and addressing Introduction to Assignment #2	
January 29	*Tuition and fee refund deadline (100%)* *Last day to drop a class from the academic record (drop with WD after)*	

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Week #4 February 1	L04 – Python Syntax and structure as applied to ArcGIS. Python libraries Introduction to RStudio & NBA API, Introduction to Assignment #3	Assignment #1 due on day of assigned lab Assignment #2 Geocoding Addresses
Week #5 February 8	L05 – Mapping with social media data Web maps and mapping Assignment #3 Help Session	Assignment #2 due on day of assigned lab Assignment #3 Using *Python* to scrape & visualize sports data
Reading Week February 13 - 21	*Reading week – no new lectures or labs during this week.*	
Week #6 February 22	L06 – Analyzing and routing along networks Assignment #4 Introduction	
Week #7 March 1	L07 – Network Strategy	Assignment #3 due on day of assigned lab Assignment #4 Network Analysis
Week #8 March 8	Assignment #4 help session	
Week #9 March 15	L08 – Multi-Criteria Evaluation/ Site selection Assignment #5 Introduction	
Week #10 March 22	Multi-Criteria Evaluation help session	Assignment #4 due on day of assigned lab Assignment #5 MCE
Week #11 March 29	Multi-Criteria Evaluation help session	
Week #12 April 5	L09 – Final Review	
Week #13 April 12		Assignment #5 due on day of assigned lab Final test (completed online on Learn).

Lecture and Lab

The course traditionally has a formal computer laboratory component, however due to the University of Waterloo's efforts to curb the spread of COVID-19, all laboratory components will be required to be

completed outside of the lab. There are two methods that you can use to access the ArcGIS Desktop software:
1. Students can use the Virtual Desktop Infrastructure (instructions on how to connect are here: https://uwaterloo.ca/environment-computing/services/remote-access-arcgis). You will use the VDI to connect to a remote desktop environment which is connected to your N: drive. Keep in mind that your N: drive is the only storage space on the VDI so you will need to be mindful of how large your datasets and processing output will be.

2. If you wish to download ArcGIS software to install on your personal machine, the University has provided access to its institutional license that permits any University of Waterloo student to download/install ArcGIS Desktop (ArcMap) or ArcGIS Pro on their personal machine, for non-commercial use. The instructions to download and install the software is provided here: https://uwaterloo.atlassian.net/wiki/spaces/ISTKB/pages/297798047/Accessing+Esri+ArcGIS+software
This option is available for students that are using a PC, or have Windows installed on their Mac.

Structured lab times will be replaced with open lab times/office hours with the TA and Instructor through the use of Bongo on Learn. These weekly sessions will be the primary time with which you can interact with the teaching assistant. While attendance will not be taken, the short duration of the course and the intensity of the material required for completion suggests that you attend each lab session to acquire the optimal level of help from your peers, the teaching assistant, and the instructor.

Administrative:

Deadlines
Assignments are due on the date specified at the top of the assignment and corresponds to the date of your assigned lab.

Late Assignment Policy

This course is inherently designed to have a class lecture and lab-based learning environment. Due to COVID-19 we are unable to have these meeting times, and sometimes a lack of ability to chat with TAs in the lab, the instructor in/after the lecture, or your peers proves difficult for completing learning objectives.

Due to these trying times, there is a "grace" period for late assignments. It is recommended that students adhere to the lab due date as outlined in this syllabus. However, there is a grace period of up to the end of the following Monday at 11:55 for you to hand in your assignment late without penalty. Unless you have made prior arrangements with the course instructor or have documented medical recommendations, the assignment will be given a grade of 0 if handed in after the grace period.

The implementation of this grace policy is designed to help students that are truly having difficulty completing the assignments due to the online learning structure that is not typical of technical courses taught within the Faculty of Environment. Please do not use this grace period as a new assignment due date, because you will fall behind in the course if it is used every time.

GEOG/PLAN 381 is a course that is modeled after the real world, with real scenarios that students have to use their wits and technical ability to solve problems without step-by-step instructions. Another way to look at this approach is that in your professional career your boss

or manager will have deadlines, and will expect results at that specified time. Again, please only use this grace period if absolutely necessary.

Also, keep in mind that on the weekend the technical support, office hours, and communication by e-mail is not readily available. If you leave assignments to the weekend and run into problems, you will be without the help that you would have during the week."

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.

*****EXTREMELY IMPORTANT INFORMATION***PLEASE 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/.]

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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.