

ADVANCED GEOGRAPHIC INFORMATION SYSTEMS WINTER 2023

GEOG 381 / PLAN 381

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CLASS SCHEDULE

Section	Location	Time	Instructor(s)
GEOG 381 001 [LEC]	AL 124	Tuesdays 8:30 a.m. - 10:20 a.m.	Peter Johnson peter.johnson@uwaterloo.ca
PLAN 381 001 [LEC]		Tuesdays 8:30 a.m. - 10:20 a.m.	
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INSTRUCTOR / TA INFORMATION

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

Office Hours: Monday 12:30 pm to 2pm, or by appointment (EV1-236 or via MS Teams). To schedule an appointment outside of these hours, please contact me.

E-mail: peter.johnson@uwaterloo.ca (mailto: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.

COURSE DESCRIPTION

Calendar Description for GEOG 381

Students learn theoretical and operational approaches to advanced spatial analysis using geographical information systems. Emphasis is placed on the use of automation procedures using models and programming to address a variety of topics that may include but are not limited to digital terrain modeling, suitability analysis, network analysis, and cell-based models. The domain of spatial problems explored may vary by instructor.

Prereq: GEOG/PLAN 255 or GEOG/PLAN 281

Calendar Description for PLAN 381

Students learn theoretical and operational approaches to advanced spatial analysis using geographical information systems. Emphasis is placed on the use of automation procedures using models and programming to address a variety of topics that may include but are not limited to digital terrain modeling, suitability analysis, network analysis, and cell-based models. The domain of spatial problems explored may vary by instructor.

Prereq: GEOG/PLAN 255 or GEOG/PLAN 281

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 **ArcGIS Pro** 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.

LEARNING OUTCOMES

By the end of this 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

TENTATIVE COURSE SCHEDULE

Date	Lecture Topics	Lab Activity	
Week #1 January 10	LO1 - Course introduction, expectations, syllabus	No labs	TEXTS / MATERIALS
Week #2 January 17	LO2 – Data management and workflows, choropleth mapping with hexagons, point analysis + clusters Introduction to Assignment #1	Assignment #1 Mapping Crime Occurrences	No materials required. STUDENT ASSESSMENT
Week #3 January 24	LO3 – Map design refresh		Assessment Outline

Week #4 January 31	Lo4 – Geocoding and addressing Introduction to Assignment #2	Assignment #1 Due Assignment #2 Geocoding Addresses
Week #5 Jan 31	Lo5 – Web maps and mapping with python and javascript	
Week #6 Feb 7	Lo6 – Python syntax and structure as applied to ArcGIS Pro Introduction to Assignment #3	Assignment #2 Due Assignment #3 ArcGIS notebooks
Week #7 Feb 14	Lo7 – Analyzing and routing along networks Introduction to Assignment #4	Assignment #4 Network Analysis Assignment #3 Due
Week #8 Feb 21	Reading Week	
Week #9 Feb 28	Lo9 – Multi-Criteria Evaluation/ Site selection Assignment #5 Introduction	Assignment #4 Due Assignment #5 MCE
Week #10 March 7	Multi-Criteria Evaluation help session	
Week #11 March 14	Multi-Criteria Evaluation help session	
Week #12 March 21	L10 – Final Review	Assignment #5 Due
Week #13 March 28		Final in-class test

Component	Value
Assignment #1 - Mapping Crime Occurrence	15
Assignment #2 - Georeferencing address data	15

Component	Value
Assignment #3 - ArcGIS notebooks	10
Assignment #4 - Network Analyst	20
Assignment #5 - Multicriteria Analysis	20
Final Test	20

All assignments to be submitted via dropbox on LEARN. Due dates are listed on the assignment outline. No late submissions are permitted, without contacting the instructor.

ASSIGNMENT SCREENING

Text matching software (Turnitin) will be used to screen assignments in this course. This is being done to verify that use of all material and sources in assignments is documented. In the first week of the term, details will be provided about the arrangements for the use of Turnitin and alternatives in this course. See Administrative Policy below for more information and links.

ADMINISTRATIVE POLICY

COVID Contingencies

This course is designed for in-person delivery, with lectures covering course content, assignment instruction, and lab sections for working with a TA to support you in completing GIS labs. If in-person instruction is not possible due to public health guidelines, the course will shift to synchronous video lectures. Attendance is highly recommended, as lectures will not be recorded. Lab sections will meet synchronously at the assigned time. All video meetings will occur using the course MS Teams team.

Intellectual Property: For further information on IP related to teaching, please see https://uwaterloo.ca/legal-and-immigration-services/sites/ca.legal-and-immigration-services/files/uploads/files/volume_1_issue_3_winter_2018.pdf (https://uwaterloo.ca/legal-and-immigration-services/sites/ca.legal-and-immigration-services/files/uploads/files/volume_1_issue_3_winter_2018.pdf) and the Guidelines for Faculty, Staff and Students Entering Relationships with External Organizations Offering Access to Course Materials, <https://uwaterloo.ca/secretariat/faculty-staff-and-students-entering-relationships-external> (<https://uwaterloo.ca/secretariat/faculty-staff-and-students-entering-relationships-external>) . The following text is recommended:

Students should be aware that this course contains the intellectual property of their instructor, TA, and/or the University of Waterloo. Intellectual property includes items such as:

- Lecture content, spoken and written (and any audio/video recording thereof);
- Lecture handouts, presentations, and other materials prepared for the course (e.g., PowerPoint slides);
- Questions or solution sets from various types of assessments (e.g., assignments, quizzes, tests, final exams); and
- Work protected by copyright (e.g., any work authored by the instructor or TA or used by the instructor or TA with permission of the copyright owner).

Course materials and the intellectual property contained therein, are used to enhance a student's educational experience. However, sharing this intellectual property without the intellectual property owner's permission is a violation of intellectual property rights. For this reason, it is necessary to ask the instructor, TA and/or the University of Waterloo for permission before uploading and sharing the intellectual property of others online (e.g., to an online repository).

Permission from an instructor, TA or the University is also necessary before sharing the intellectual property of others from completed courses with students taking the same/similar courses in subsequent terms/years. In many cases, instructors might be happy to allow distribution of certain materials. However, doing so without expressed permission is considered a violation of intellectual property rights.

Please alert the instructor if you become aware of intellectual property belonging to others (past or present) circulating, either through the student body or online. The intellectual property rights owner deserves to know (and may have already given their consent).

Co-op interviews and class attendance: Co-op students are encouraged to try and choose interview time slots that result in the least amount of disruption to class schedules. When this is challenging, or not possible, a student may miss a portion of a class meeting for an interview. Instructors are asked for leniency in these situations; but, a co-op interview does not relieve the student of any requirements associated with that class meeting.

When a co-op interview conflicts with an in-class evaluation mechanism (e.g., test, quiz, presentation, critique), class attendance takes precedence and the onus is on the student to reschedule the interview. CEE provides an interview conflict procedure to manage these situations.

Students will be required to provide copies of their interview schedules (they may be printed from WaterlooWorks) should there be a need to verify class absence due to co-op interviews.

Mental Health: The University of Waterloo, the Faculty of Environment and our Departments/Schools consider students' well-being to be extremely important. We recognize that throughout the term students may face health challenges - physical and / or emotional. **Please note that help is available.** Mental health is a serious issue for everyone and can affect your ability to do your best work. Counselling Services <https://uwaterloo.ca/campus-wellness/> (<https://uwaterloo.ca/campus-wellness/>) 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.

All students are encouraged to download the WatSAFE app which is available free through the google and iOS app stores. The WatSAFE app provides on- and off-campus contacts for students in distress, including international students, and other information related to campus safety and security.

Religious Observances: Students need 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.

Communications with Instructor and Teaching Assistants: All communication with students must be through either the student's University of Waterloo email account or via LEARN. If a student emails the instructor or TA from a personal account they will be requested to resend the email using their personal University of Waterloo email account.

Recording lecture: Use of recording devices during lectures is only allowed with explicit permission of the instructor of the course. If allowed, video recordings may only include images of the instructor and not fellow classmates. Posting of videos or links to the video to any website, including but not limited to social media sites such as: facebook, twitter, etc., is strictly prohibited.

UNIVERSITY POLICY

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 [the Office of Academic Integrity](https://uwaterloo.ca/academic-integrity/) (<https://uwaterloo.ca/academic-integrity/>) for more information.]

Grievance: A student who believes that a decision affecting some aspect of their university life has been unfair or unreasonable may have grounds for initiating a grievance. Read [Policy 70, Student Petitions and Grievances, Section 4](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70) (<https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70>) . 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 to avoid committing an academic offence, and to take responsibility for their actions. [Check [the Office of Academic Integrity](https://uwaterloo.ca/academic-integrity/) (<https://uwaterloo.ca/academic-integrity/>) for more information.] 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](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71) (<https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71>) . For typical penalties, check [Guidelines for the Assessment of Penalties](https://uwaterloo.ca/secretariat/guidelines/guidelines-assessment-penalties) (<https://uwaterloo.ca/secretariat/guidelines/guidelines-assessment-penalties>) .

Appeals: A decision made or penalty imposed under [Policy 70, Student Petitions and Grievances](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70) (<https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70>) (other than a petition) or [Policy 71, Student Discipline](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71) (<https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71>) may be appealed if there is a ground. A student who believes they have a ground for an appeal should refer to [Policy 72, Student Appeals](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-72) (<https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-72>) .

Note for students with disabilities: [AccessAbility Services](https://uwaterloo.ca/disability-services/) (<https://uwaterloo.ca/disability-services/>) , located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

Turnitin.com: Text matching software (Turnitin®) may be used to screen assignments in this course. Turnitin® is used to verify that all materials and sources in assignments are documented. Students' submissions are stored on a U.S. server, therefore students must be given an alternative (e.g., scaffolded assignment or annotated bibliography), if they are concerned about their privacy and/or security. Students will be given due notice, in the first week of the term and/or at the time assignment details are provided, about arrangements and alternatives for the use of Turnitin in this course.

It is the responsibility of the student to notify the instructor if they, in the first week of term or at the time assignment details are provided, wish to submit alternate assignment.