GEOG 381 / PLAN 381

Advanced Geographic Information Systems

Winter 2017

Instructor:	Derek T. Robinson
Email:	dtrobins@uwaterloo.ca
Office:	EV1-105a
Office hours:	Thursday 2:30 p.m. – 4:00 p.m.

Lecture:	Monday 2:30 p.m. – 4:20 p.m.
Lecture room:	MC 4042

Computer lab:	EV1-240 (Galileo Centre)
Lab time:	Lab 101 8:30-10:20 Mondays
	Lab 102 10:30-12:20 Mondays
	Lab 103 10:30-12:20 Wednesdays
	Lab 104 4:30-6:20 Fridays

Prerequisites:	GEOG/PLAN 281 (or GEOG/PLAN 255)

Teaching assistant:	Paul Donchenko pdonchen@uwaterloo.ca
Lab hours:	Lab 101 8:30-10:20 Mondays
	Lab 102 10:30-12:20 Mondays

Teaching assistant:	Jennifer Ridge jridge@uwaterloo.ca
Office hours:	Lab 103 10:30-12:20 Wednesdays
	Lab 104 4:30-6:20 Fridays

Calendar Description

"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."

Course Description and Learning Objectives

The course builds on the knowledge and skills you developed in GEOG/PLAN 281 and focuses on automating GIS procedures to perform selected types of spatial analyses. Students will learn how to perform different types of automation and spatial analyses, critically evaluate the advantages and limitations of different approaches to automation and spatial analysis, and gain a better understanding of the advanced capabilities of GIS. This course is a prerequisite for GEOG / PLAN 481 and 487 and is part of the requirements for the Diploma of Excellence in GIS.

The course is organized into four modules: (1) multi-criteria analysis using ArcGIS Model Builder, (2) customization of geoprocessing tasks using python, (3) network analysis, and (4) using python for data management and spatial analysis.

References

There is no required textbook for this course. Course notes and slides will be provided as electronic documents on Waterloo LEARN. Students are expected to make use of the online help files for the ArcGIS software, discussion groups in the online learning platform, and other web-based GIS resources. The following books cover part of the course and are suitable for further reading and available in the course reserves either electronically or at the Porter library:

De Smith, M.J., M.F. Goodchild & P.A. Longley (2007). *Geospatial analysis: a comprehensive guide to principles, techniques and software tools*. Matador.
Available electronically at http://www.spatialanalysisonline.com

Lloyd, C.D., (2010). Spatial data analysis: an introduction for GIS users. Oxford University Press.

Lutz, M. (2009). *Learning Python*. 4th edition, O'Reilly.
Available electronically through the library / course e-reserves.

O'Sullivan, D. & D.J. Unwin (2010). *Geographic information analysis*. Wiley.
Available electronically through the library / course e-reserves

Wilson, J.P. & J.C. Gallant (2000). *Terrain analysis: principles and applications*. Wiley.

Schedule

The course comprises a 2-hour lecture held on Mondays from 2:30-4:20pm and a 2-hour lab. The lecture will be used to introduce the theory and concepts behind suitability and network analysis methods as well as to demonstrate techniques that will aid the completion of lab assignments. Significant additional time will be required for independent and group study to complete assignments and develop necessary skills (see also section *Getting Help* below). The schedule of course content and assignments are subject to change. If a change is made students will be notified during course lectures and via the news feed for the course on the course website.

#	Date	Type (*)	Topic	Assignment
1	9 Jan	Lec	Introduction to Spatial Analysis	
2	16 Jan	Lec	Introduction to Multi-Criteria Evaluation using ArcGIS Model Builder	A1a Distributed
3	23 Jan	Lec	Geoprocessing with Model Builder and how to report results and spatial patterns	A1b Distributed
4	30 Jan	Lec	Introduction to Geoprocessing using models and Python scripts	A2 Distributed
5	6 Feb	Lec.	Geoprocessing and scripting with Python continued.	
6	13 Feb	Lec	Geoprocessing and scripting with Python continued.	A3 Distributed
7	20 Feb	Lec	*Family Day Holiday and Study Days*	
8	27 Feb	Lec	Introduction to Network Analysis	
9	6 Mar	Lec	ArcGIS Network Analyst Tutorial	A4 Distributed
10	13 Mar	Lec	Using python for data management and spatial analysis	
11	20 Mar	Lec	TBD	
12	27 Mar	Lec	Approaches to positioning and georeferencing and Review Session	
13	3 Apr	Lec	Written test	Test (25%)

* Lec = Lecture, Computer labs are Section 101 8:30 – 10:20 Thursdays,
Section 102 4:30 – 6:20 Tuesdays

Method of Evaluation

Item	Format / Topic	Due Date	Contribution
Assignment 1a	Geoprocessing with Model Builder Part 1	Jan. 23	10%
Assignment 1b	Geoprocessing with Model Builder Part 2	Jan. 30	7%
Assignment 2	Geoprocessing with Python	Feb. 13	16%
Assignment 3	Network analysis	March 6	16%
Assignment 4	Python for data management	March 20	16%
Final Test	In-class test	April 3	25%
Peer Evaluation			10%

There is one written test (25%), four assignments (65% in total), and peer evaluation (10%). Assignments must be submitted to the appropriate drop box on the course website by 9:55 am on the due date. Group assignments submitted late will receive a mark of zero under all circumstances since there will be multiple people available to submit. Individual assignments will also receive a mark of zero, but exceptions will be made for documented extreme medical reasons. In the case where a group member drops the course, the group is still required to submit the assignment on time. Good project management will be critical to your success and we will discuss how to avoid being affected by under performing group members.

Computer Labs

You can use the Galileo (EV1-240), Geddes (EV2-1002A) or Magellan (EV2-1014) labs for practical work in this course when they are not booked for other courses. Access codes are available at the Mapping Analysis and Design helpdesk in EV2.

NOTE: No food or drink is allowed in the labs. Failure to abide by this rule may result in your computer accounts being suspended.

Course Website

A course website has been created on the new learning platform "Learn" (Desire2Learn). Information on access to the website will be provided in class. Students registered and who have paid their tuition for the course can access the course website after the first class by going to the LEARN website (http://learn.uwaterloo.ca) and logging in using your WatIAM/Quest username and password. Once logged in, you will see the course listed under "My Courses and Communities". Click on GEOG 381/PLAN 381 to see the course content.

The course website provides access to lecture presentations, course notes on selected topics, datasets needed for the assignments, and assignment scripts. These documents can be opened or downloaded by clicking on the appropriate link. In addition, the course website supports announcements, discussion groups and e-mail. Assignments will be handed in via the LEARN course website and students should become familiar with the website and submission process early so as not to receive a late submission.

Getting Help

Students are expected to get into the habit of using the on-line help files as their **first** source of help. The TA and instructor will be available during scheduled help sessions and office hours to answer questions related to the assignments. Additional help is available from the MAD help desk.

Email

Please include the course shortcode and your family name in the subject of your email (e.g. Robinson GEOG/PLAN 381). The instructor or TA will try to respond to emails within 24hrs excluding weekends (i.e. Friday 5pm to Monday 8am). The instructor will respond to emails regarding course content or logistics, while questions or concerns regarding evaluation will be reserved for discussion during office hours.

Email and online discussions are governed by the same rules of academic conduct as your

behavior in class. Please use common courtesy, be polite, and, of course, avoid sending or forwarding aggressive, sexist, racially discriminatory, obscene, offensive, libelous, or defamatory comments of any kind. If the instructor does not respond to your email within 24 hours please send me another email or see me in person as it may have been deleted by a spam filter or a server may have been down when the email was sent. Email can be a benefit to both the student and instructor objectives; however, email is not a substitute for one-on-one discussion and therefore I prefer to meet with you during office hours.

Administrative Matters

Academic Integrity: To create and promote a culture of academic integrity, the behaviour of all members of the University of Waterloo is based on honesty, trust, fairness, respect and responsibility. Students are strongly encouraged to review the material provided by the University's Office of Academic Integrity: http://www.uwaterloo.ca/academicintegrity/. Students who are unsure what constitutes an academic offence are requested to visit the on-line tutorial at: http://www.lib.uwaterloo.ca/ait/

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, http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm. When in doubt, please contact your Undergraduate Advisor for details.

Discipline: A student is expected to know what constitutes academic integrity, to avoid committing academic offenses, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offense, or who needs help in learning how to avoid offenses (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 – Student Discipline. For information on categories of offenses and types of penalties, students should refer to Policy 71 - Student Discipline, http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm . For typical penalties, check Guidelines for Assessment of Penalties, http://www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm

Appeals: A student may appeal the finding and/or penalty in a decision made under Policy 70 - Student Petitions and Grievances (other than regarding a petition) or Policy 71 - Student Discipline if a ground for an appeal can be established. Read Policy 72 - Student Appeals,
http://secretariat.uwaterloo.ca/Policies/policy72.htm

Note for students with disabilities: The AccessAbility Services, located in Needles Hall, Room 1132, 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 the AccessAbility Services at the beginning of each academic term. It is imperative that you address all aspects of your situation with the instructor as close to the start date of the course as possible to ensure a fair outcome for yourself, your classmates, and for the instructor.

Religious Observances: Please 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.

***Turnitin* Software**: Plagiarism detection software (Turnitin) may be used to screen assignments in this course. This is may be done to verify that use of all materials and sources in assignments is documented. Students will be given an option if they do not want to have their assignment screened by Turnitin. In the first week of the term, details will be provided about arrangements and alternatives for the use of Turnitin in this course.

Group Assignment Checklist: All group members are required to fill in, sign, and as a group submit on LEARN a group assignment checklist. The group assignment checklist template is posted on our course LEARN website. Several scanners are available to students following signing of the form, which are located in the General Windows Lab EV2-1011 and four are located in the General Mac Lab EV1-136.