GEOG*3480 GIS and Spatial Analysis (0.5 CR)

The University of Guelph, Department of Geography, Environment and Geomatics
Winter 2024, 0.5 Credits (DRAFT)

Instructor: Dr John Lindsay
Office: Hutt Rm. 122
Email: jlindsay@uoguelph.ca
Phone: 519-824-4120 ext. 56074
Office hours: Fridays 10:00-11:00

Prerequisite 10.00 credits, including GEOG*2480

Overview

This course is one of four 3rd year courses (the others being GEOG*3420 Remote Sensing of the Environment, GEOG*3430 Geomatics for Environmental Analysis, and GEOG*3440 GIS for Decision Making) in the Geomatics stream of courses offered by Geography. GEOG*2480 Mapping and GIS an introduction to the fields of cartography and geographical information science, which is necessary to provide the theoretical foundation on which this course, GEOG*3480, is positioned. The focus of this course is on the analysis of geographical data using GIS and related Geomatics technologies. The third-year geomatics courses provide the analytical background necessary for the thematic capstone course, GEOG4480 Applied Geomatics.

Course Calendar Description

This course focuses on the use of raster and vector-based geographic information systems to analyze spatial data. Topics include overlay, spatial interpolation, multi-criteria evaluation, least cost pathway determination, digital elevation models and surface analysis, and network analysis. This course requires some familiarity with numerical methods and computer operations.

Learning Outcomes

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

• Understand the foundational theories of GIS including the unique character of spatial data.
• Analyze geospatial data using GIS software.
• Understand spatial analysis techniques and practices.
• Practice communicating concepts through formal written and visual forms.
• Identified key issues related to spatial data error.

Course Organization

This course is a face-to-face (F2F) offering. There will be three lectures per week on Monday/Wednesday/Friday 11:30 AM - 12:20 PM in GRHM 2310. In addition, each student must attend one two-hour lab per week.

Text and Other Resources

Readings for this class will be drawn from the required text:

Kang-Tsung Chang (2019) *Introduction to Geographic Information Systems 9th Edition* McGraw-Hill, ISBN-978-1-260-09258-5.

Import Dates

Monday January 8 — First class
Monday February 19 — Winter Break (no classes this week)
Friday March 1 — Mid-term examination (in class; worth 30%)
Friday March 29 — Holiday (no class)
Friday April 5 — Last day of classes
Monday April 22 — Final examination, location to be announced (worth 30%)

Method of Evaluation

The lab material constitutes an integral part of this course, since this is where students receive hands on work with data, and must apply the techniques they have learned. Labs must be handed in to the teaching assistant at the beginning of lab section in the week they are due, with a late penalty of 10% of the total assignment grade per day.

Grade Distribution

- Lab Assignments: 4 lab assignments x 10% = 40%
- Mid Term Exam: 30%
- Final Exam: 30%

The mid-term exam will be held **Friday March 1**. There will be no lecture that day. The final exam is currently scheduled for **Monday April 22 08:30AM - 10:30AM**. **The final exam is NOT cumulative and will only cover topics after the cut-off point (given in lecture) for the mid-term exam.** Each of the lab assignments will have a tutorial component and an exercise component. The tutorial component will be assessed with a small quiz and the exercise will be assessed with a submitted report. Note that there is no opportunity for students to re-weight lab assignments or exams when assessments are not submitted.

Office Hours

If you are having questions regarding the lab, please see one of the course TAs. TA office hours are to be scheduled and will be announced upon first meeting. For any other matters, including lecture content and any personal issues, please feel free to visit me during my office hours (Stated above) or e-mail me (jlindsay@uoguelph.ca).

Lecture Topics

Week	Date	Lecture Topic	Notes
1-M	Jan. 8	Course overview	

1-W	Jan. 10	Introduction to GIS	
1-F	Jan. 12	Introduction to GIS	
2-M	Jan. 15	Introduction to GIS	Lab 1 assigned
2-W	Jan. 17	Spatial Data and Data Quality	
2-F	Jan. 19	Spatial Data and Data Quality	
3-M	Jan. 22	Spatial Data and Data Quality	
3-W	Jan. 24	Basic GIS Analysis Operations	
3-F	Jan. 26	Basic GIS Analysis Operations	
4-M	Jan. 29	Basic GIS Analysis Operations	
4-W	Jan. 31	Multi-criteria Evaluation (MCE)	
4-F	Feb. 2	Multi-criteria Evaluation (MCE)	
5-M	Feb. 5	Least-cost Pathway Analysis (LCPA)	
5-W	Feb. 7	Least-cost Pathway Analysis (LCPA)	
5-F	Feb. 9	GIS Modelling and Programming	
6-M	Feb. 12	GIS Modelling and Programming	Lab 2 assigned
6-W	Feb. 14	Statistical analysis of Geospatial Data	
6-F	Feb. 16	Correlation and Spatial Autocorrelation	
	Feb. 19	*Winter break*	
	Feb. 21	*Winter break*	
	Feb. 23	*Winter break*	
7-M	Feb. 26	Point Pattern Analysis	
7-W	Feb. 28	Geographically Weighted Regression	
7-F	**Mar. 1**	**Mid-term Exam**	
8-M	Mar. 4	Analyzing Circular Data	
8-W	Mar. 6	Spatial Interpolation	
8-F	Mar. 8	Spatial Interpolation	
9-M	Mar. 11	Spatial Interpolation	Lab 3 assigned
9-W	Mar. 13	Surface Analysis	
9-F	Mar. 15	Surface Analysis	
10-M	Mar. 18	Surface Analysis	
10-W	Mar. 20	Viewshed Analysis	
10-F	Mar. 22	Watershed Analysis	
11-M	Mar. 25	Watershed Analysis	Lab 4 assigned
11-W	Mar. 27	Watershed Analysis	
11-F	Mar. 29	*Holiday*	
12-M	Apr. 1	Network Analysis	
12-W	Apr. 3	Wrap-up	
12-F	Apr. 5	Wrap-up	
13-F	Apr. 8	Wrap-up	
	April 22	*Final Exam*	Good Luck! Room TBA

Please note **individual readings to support lecture materials will be assigned at the start of each lecture and will be posted in the lecture slides**. Also, the topics and topic order provided

above are tentative and may change with the progression of the course. Please check with the lecture slides on the CourseLink site for a more accurate listing.

Laboratory Exercises

The labs are designed to familiarize you with basic GIS operations, and to teach you problem solving skills. You are going to solve a variety of problems using ArcPro. By completing the labs, you will gain practical experience in using the program to create and edit datasets, manipulate and analyze data, and generate maps that communicate spatial information effectively. At the same time, you will lay the foundation for learning any other GIS software.

Your Graduate Teaching Assistant (GTA) will make an arrangement with you regarding handing in the labs. Your GTA will be available to help you during the scheduled lab times. GTAs are not required to be available outside of these times! If your GTA helps you outside of scheduled times, then he/she is doing you a favour; please be considerate of this.

All of the labs require that you submit your own work. It's okay to learn the program with a classmate, or to ask other people for help when you run into trouble. (In fact, you should do the tutorials with a classmate.) However, the labs that you submit must be the product of your own effort.

Depending on your experience, you will have to learn ArcPro and a range of new skills in order to complete these labs. This is a real challenge -- even for someone who is familiar with computers. From previous experience, when students had difficulty completing the labs, problems often occurred because of unfamiliarity with the computer and its operating system. You need to be a competent computer user, or be willing to upgrade your skills in the first weeks of the course. Losing 10 hours of work because you didn't copy your files properly is no fun!

Once you have completed the tutorials and know the programs, you should be able to complete the labs in 4 to 6 hours each. However, it may take you much longer if you combine learning the program with doing the labs. Therefore, until you are comfortable using the computer and the software, you should plan to spend a lot of time learning the basics.

Lab attendance is mandatory and attendance will be recorded by the GTA each week. GTAs will not respond to the e-mail questions of students who fail to regularly attend a lab section.

Note, lab due dates are subject to change in the event of unforeseen scheduling conflicts. Please confirm the exact due dates and times with your GTA well in advance. These should be provided during the GTA introduction of each new lab assignment. Changes to this schedule will be posted on CourseLink if required.

Laboratory Times

You have been assigned to one of the three/four lab periods. All labs take place in the Hutt Building, Room 231. Your GTA will be available to help you during your lab period. The computer facilities in Room 231 will be available outside these times on a first-come, first-served basis during scheduled free times. A schedule will be posted on the door of Room 231.

You must attend your assigned lab period. If you missed your assigned lab period for a valid reason, attend another session and inform the GTA that you normally are in another lab (identify time and GTA). You may not change your lab period without the permission of the instructor.

- 0101 Th 7:00 PM - 9:00 PM Hutt 231
- 0102 M 8:30 AM - 10:20 AM Hutt 231

Disclaimer

Please note that unforeseen circumstances (e.g., a pandemic) may necessitate a revision of the format of course offerings, changes in classroom protocols, and academic schedules. Any such changes will be announced via CourseLink and/or class email.

Illness

Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g. final exam or major assignment).

For information on current safety protocols, follow these links: https://news.uoguelph.ca/return-to-campuses/how-u-of-g-is-preparing-for-your-safe-return/

https://news.uoguelph.ca/return-to-campuses/spaces/#ClassroomSpaces

Please note, these guidelines may be updated as required in response to evolving University, Public Health or government directives

E-mail Communication

As per university regulations, all students are required to check their <uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. See the undergraduate calendar for information on regulations and procedures for Academic Consideration.

Drop Date

Courses that are one semester long must be dropped by the end of the last day of classes; two-semester courses must be dropped by the last day of classes in the second semester. The regulations and procedures for Dropping Courses are available in the Undergraduate Calendar.

Copies of out-of-class assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to make a booking at least 7 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time.

More information: www.uoguelph.ca/sas

Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar.

Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.