GGR373: ADVANCED GEOGRAPHIC INFORMATION SYSTEMS

University of Toronto, Fall 2020
Tuesday 1pm–3pm
Online

Instructor: Kristian Larsen

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Virtual Office Hours via Zoom: Monday 11am–12pm or by appointment

Teaching Assistants

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Course Description

Over the past years, researchers and professionals have increasingly turned to GIS for acquiring, processing, analyzing and mapping environmental and socio-economic data. This course covers advanced topics in understanding and using GIS. The lectures will cover the fundamental theory of GIS, and will discuss examples of how it is implemented in GIS software. Much of the course will also deal with advanced GIS methods for problem solving. Students will learn and complete case studies that are not only relevant to Geography, but also Public Health, Transportation Planning, Business and other disciplines. Tutorial sessions will give the students an opportunity to learn and practice GIS through practical assignments. They will learn how to use global position systems, create three-dimensional surfaces, and perform advanced spatial analysis. Students will also learn how to use Network and Spatial Analyst among other extensions.

Learning Outcomes

• Develop a greater understanding of GIS
• Use GPS to create their own GIS data
• Create a 3-D surface
• Develop an understanding of the GIS extensions
• Learn about advanced spatial analysis
• Use and understand Network Analyst

Course Organization

Class Format

This is an online course. Synchronous lectures will be given from 1pm–3pm on Monday, students will have the opportunity for synchronous online discussion and questions during class times. These lectures will be recorded and posted online for future viewing. There will also be synchronous online lab sessions, which are optional but provide an excellent opportunity for student to obtain help from the teaching assistant.

Software

The course uses ArcGIS software from Esri Inc., the most popular GIS software and an industry standard in many fields. Students need to obtain a student copy of ArcGIS from the map and data library for their own PC. Mac users can install Bootcamp to install ArcGIS or can use citrix. Citrix will work to complete the work but it can be quite slow at peak times. You need to be able to work with ArcGIS on your own computer to complete this course as no lab computers will be available on campus.

Install ArcGIS on your own computer

PC: Students can download and install a free, one-year student edition of ArcGIS on a Windows computer. All of the assignments and data will be available online. You can download the software from the University of Toronto Map and Data Library and if you need installation assistance, contact gis.maps@utoronto.ca.

Fill the form to request a license first.

Follow the installation tutorial after obtaining a license.

Mac: ArcGIS is Windows-only but can be installed on a Mac using a free utility called Boot Camp that comes with OS X and later (but you will need a valid copy of Windows). For information on Boot Camp.

PC or Mac no local install

Citrix: Instructions on installing citrix are available on quercus.

Remote access to lab computers: The department labs and lab 561 at St. George Campus will be available for students those who have registered for courses offered by Department of Geography and Planning. Details are available on quercus.

Please note, you are responsible to ensure you have a working version of ArcGIS on your own computer. The map and data library staff, instructor and TA's are willing to help, but many of us do not work on Mac computers.

Online Lectures– via Blackboard Collaborate

Tuesday : 1pm-3pm

Course website

Quercus: q.utoronto.ca

Log in using your UTORid and password.

All assignments will be submitted online. The timestamp for submission will be used to determine whether the assignment is late.

Online submissions for term work

It is every student's responsibility to ensure that their online submission is submitted successfully by the due date. Accommodations will not be made for unsuccessful submissions due to, but not limited to, i)

the system timing out ii) submitting the incorrect document(s) iii) poor internet connection / no internet connection / hydro outage etc.

There will be **4 practical assignments** in this course. Assignments will be submitted electronically and due at 12pm on Tuesday the week it is due, details on online submission are available on quercus.

Technical problems

This course uses computers, and there are many things can go wrong when using them. You are responsible for ensuring that you maintain regular backup copies of your files and schedule enough time when completing an assignment to allow for delays due to technical difficulties. Computer viruses, crashed hard drives, broken printers, lost or corrupted files, incompatible file formats, and similar mishaps are common issues when using technology, and are not acceptable grounds for an extension.

Labs (online)

There are virtual lab sessions for GGR373 where the TA will be available to assist you with your assignments. Please note that the teaching assistant's role is to guide you and make suggestions but in order to learn the concepts and software, you must be prepared to try things on your own. The TAs will not give you the answers to assignment questions, as this would deny you the chance to learn for yourself. Unlike GGR272 and GGR273, there <u>are</u> lab sessions in this course. While labs are not mandatory, you are responsible for the material covered by the TA. Not completing the assignments as the TA instructs may cause a loss of marks. If you wish to drop in on the other lab session, please ask the TA if there is availability – if there is, you are welcome to attend.

> **Labs start on Tuesday September 22 and end on November 18**
>
> **No labs during reading week (November 10 and 11)**
>
> ***Blackboard Collaborate – on Quercus***
>
> > Tuesday 4pm—6pm
> >
> > Wednesday 10am—12pm
> >
> > Wednesday 1pm—3pm

Assignments and Evaluation

Key Dates

1.	Lab 1	5%	October 6 , 2020
2.	Lab 2	15%	October 20, 2020
3.	Lab 3	15%	November 3, 2020
4.	Lab 4	15%	November 24, 2020
5.	GIS lit review	15%	December 8, 2020
6.	Test 1	5%	October 23, 2020
7.	Test 2	5%	November 20, 2020

8. Final Assessment 25%   TBA

Assignment Details

Assignment 1 – Lab 1
October 6 - 10%

Collector app and Global Positioning System: The goal of this assignment is to learn how to use the Esri Collector app, create some GIS data, and understand what factors might affect the accuracy of that data.

Assignment 2 – Lab 2
October 20 - 15%

Raster analysis: The goal of this assignment is to learn how to perform various types of raster analysis.

Assignment 3 – Lab 3
November 3- 15%
Terrain analysis: The goal of this assignment is for you to learn how to perform several different functions related to terrain analysis.

Assignment 4 – Lab 4
November 24 - 15%
Network analyst: The goal of this assignment is for you to learn how to perform basic analysis by using the network analyst extension.

GIS application term paper
December 8 - 15%
This assignment is designed to get you acquainted with the published research literature concerning the use of geographic information systems in your particular field of interest. Much of this course, and your previous GIS courses, are geared towards introducing you to the fundamental concepts and techniques of GIS. However, it is not possible to address how GIS is actually used in all of the fields of inquiry represented by the variety of students in the class. Therefore, this assignment gives you the opportunity to explore how GIS is related to your own area of interest through the completion of a literature review that is no more than 1,000 words in length.

Tests
You will have two open book online tests. You will be challenged to locate, define, explain and apply concepts and methods from both lectures and assignments. Test availability in the table above refers to the time over which each quiz will be available for completion online. Each test will be available for five days from 9:00 a.m. on the start date, until 5:00 p.m. on the end date as posted below. You can start or continue your test anytime while it is available. Keep in mind, once you answer a question (even if you leave it blank) you will not be able to change your answer.

Test 1: 5% - Available October 19 – October 23, 2020

Test 2: 5% - Available November 16 – November 20, 2020

Final assignment

The final assignment will be completed online and is similar to a final exam, it will be open book and you will have two and a half days to complete. It will take place during the final assessment period in December and will cover the content of the entire course.

Late Penalties

Late submission of assignments will result in a deduction of 10% per calendar day (weekends included) for a maximum of 7 days. If an assignment has been marked and handed back to the class, no other assignments will be accepted (even if it has not been 7 days).

Required Text

Chang, Kang-tsung. 2018. Introduction to Geographic Information Systems, 9th Edition. Toronto: McGraw-Hill.

You can use the paper or online version of the text. Online version can be purchased here.

You will be assigned weekly readings from the course text and from other sources. You are expected to have read the assigned materials prior to lecture. Midterm test and final exam will include questions to assess your ability to recall, define, and apply concepts and methods drawn from the assigned readings.

Course Schedule

Week 1 – September 15

Course Introduction: About the class and instructor
Readings: No readings

Week 2 – September 22

Global positioning systems: How GPS works and ArcGIS collector App
Readings: Chapter 5

Week 3 - September 29

Review Raster Data: Raster data structure and analysis
Readings: Chapter 4

Week 4 - Oct 6

Raster Data Analysis: Perform analysis
Readings: Chapter 12

Week 5 - October 13

Terrain Mapping and Analysis: Exploring 3-D data
Readings: Chapter 13

Week 6 - October 20

Viewshed and Watershed Analysis: Applications and factors
Readings: Chapter 14

Week 7 - October 27
Network Analyst 1: Building a network dataset
Readings: Chapter 17

Week 8 - November 3
Network Analyst 2: Shortest path analysis
Readings: Assigned readings

November 10 - No Class - Reading Week

Week 9 - November 17
Spatial Interpolation 1: Data acquisition, relational database and queries
Readings: Chapter 15

Week 10 - November 24
Spatial Interpolation 2: Density surfaces, simple and kernel density
Readings: Assigned readings

Week 11 - December 1
GIS Models and Modeling: Basic elements of GIS models
Readings: Chapter 18

Week 12 - December 8
Course review
Readings: No readings

Notes:
1. All labs will be assigned during the lectures. Each assignment will be digitally available through the course website (Quercus) on the day of that week's lecture.
2. The assignments are due at 12pm on the day of class (Tuesday) for the week it is due.
3. The instructor may change the topic and content of the lectures at a later time.

Course Policies & Expectations

Accessibility needs
The University of Toronto and the course instructor are committed to accessibility. If you require accommodations or have any accessibility concerns, please visit the Accessibility Services website. For other needs (i.e. Religious, Illness, etc.) please see the professor in private before the assignment or exam due date.

Academic integrity
Plagiarism and other academic offences including impersonating another student or providing false or altered medical forms, death certificates, or similar documents will not be tolerated. For more information, please refer to the Code of Behaviour on Academic Matters.

Use of class materials and copyright notice

The materials used in this class, including, but not limited to lecture notes, video recordings, exams, quizzes, and assignments are copyright protected works. If a student wishes to photograph, record audio and/or video, or otherwise reproduce lecture presentations, course notes or other similar materials provided by the instructor, he or she must obtain the instructor's written consent beforehand. Otherwise, all such reproduction is an infringement of copyright and is absolutely prohibited. In the case of private use by students with disabilities, the instructor's consent will not be unreasonably withheld.

Technical problems

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Remarking requests

Any inquiries about marking must be made within two weeks of the return date of the work. This is in accordance with Arts and Science rules as stated in the calendar. Please contact the person that did the marking first. If, after discussing the issue with the marker, you are still not satisfied with the explanation for your mark, you should then contact the instructor.

Geography math help centre

Geography TAs will be available to help refresh and explain mathematical concepts and techniques that may come up in your geography courses. This includes working with formulas, graphing data, completing calculations, and so forth. It does not matter how basic your questions are! No appointment is required, just drop by. There will also be table space available in the room, allowing students to get math help as they work through assignments. Details on location and TA times posted here.

In case of illness

Requests for assignment deadline extensions must be made to the instructor within five business days after the deadline. The University is temporarily suspending the need for a doctor's note or medical certificate for absences from academic participation. Please use the Absence Declaration tool on ACORN to declare an absence if you require consideration for missed academic work. You are responsible for contacting your instructors to request the academic consideration you are seeking. Record each day of your absence as soon as it begins, up until the day before you return to classes or other academic activities.

Expectations and course policy

Students are expected to demonstrate their knowledge of all course material (e.g., lecture notes, readings). Students are required to engage in a significant amount of independent study. To be successful, students will have to commit to working on assignments and papers outside of regularly scheduled class time. All assignments are due at the times indicated by your professor.