

# GGR373: Advanced GIS

## Course Description

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This course covers advanced topics in understanding and using geographic information systems (GIS). Students learn how to use a global positioning system, perform raster analysis, create and analyze three-dimensional surfaces, visualize geospatial data, and perform advanced spatial analysis. The lectures discuss underlying theory and its implementation in GIS software. The assignments give students the opportunity to learn for themselves how to put that theory into practice, gaining hands-on experience with ArcGIS Desktop from [Esri Inc.](#), the most popular GIS software and an industry standard in many fields.

**Prerequisites:** GGR272, GGR273.



## Orientation to the Course

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This course is designed so that you can treat it as a traditional face-to-face course, an online course, or a mix of both. The course is structured around weekly topics and activities. Regular classes are held each Tuesday afternoon, and you can attend these in person or online. These lectures are also recorded so you can watch them later. The PowerPoint slides used will be made available as PDF files.

Online software demonstration videos will not be provided in this course. Having completed two previous GIS courses, you are now expected to be able to work independently, explore the software, and find whatever resources you may need to help you learn and complete the assignments.

There is no required textbook for this course. Links to online readings will be provided by the instructor.

Over the course of each week, you are expected to attend and/or watch the lectures, read all assigned readings, complete assignments, and participate in online discussions as needed. All of the necessary material for each topic is clearly organized and available on the Blackboard course website (under "Course Materials").

In this course, you have the option to gain experience with a variety of communication tools including webinars, videoconferencing, screen sharing, podcasts, discussion forums, and chat windows. Think of this as another aspect of your learning and take the opportunity to learn how to use them effectively.

**Please keep in mind:** Many of the concepts and skills learned in this course are cumulative. It is essential that you complete all work each week so that you are properly prepared to begin the next week's material. This course is designed to provide great flexibility as to when you work on it, but if you treat it as an online course, it will require more time than a regular course, not less (because you're working more independently) and it's also easier to procrastinate and fall behind. This is why online courses have higher drop rates - don't let this happen to you! If you find you are getting behind, ask for help from your TA or instructor as soon as possible.

**Online discussion:** There is a lot to learn in this course, and you will find that interacting with other students, the teaching assistants, and the instructor will make your learning experience more efficient and more enjoyable. You are strongly encouraged to ask and answer questions on Piazza, a separate discussion board website. You can subscribe to the discussion board so that you are notified when there is a new post, to save you having to check it all the time. You will not be evaluated based on your level of participation in online discussions, but it will likely help you with the other aspects of the course in which you *are* being evaluated.

## Instructor

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Website: <http://portal.utoronto.ca> (Blackboard, requires UTorID & password)

Please feel free to contact me, but be sure to first check the course website and the discussion board and course files to see if the answer to your question is there.

### Office hours

**In person:** open-door policy; drop by or make an appointment. Sidney Smith Hall room 5011.

**Online:** by appointment (just [e-mail me](#) to set up a time).

Online office hours are held using Adobe Connect web conferencing software using the same URL as for the lectures (it will be posted on Blackboard). The instructor can show PowerPoint slides, do live software demonstrations, and meet with students individually or many at the same time (you can ask questions by typing in a chat window or with a microphone or webcam).

## Evaluation

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### Assignments: 35%

The assignments are designed to help you see the connections between the concepts discussed in the lectures and how those concepts are applied in the software. By the end of the course, you should be able to make informed decisions about what tools to use and how to use them, both individually to answer specific questions, and in a sequence to solve larger problems. You should also be able to communicate your results as maps and in other formats, and interpret and discuss their meaning.

The time required to complete the assignments varies a lot depending on the person. You will be learning how to use complex software, and gaining practical skills in mapping and problem solving, so you should be prepared to commit a substantial amount of time (likely several hours) to this each week.

All assignments are due on the dates indicated on the schedule, which are **Tuesdays at 9:00 am.**

### Midterm test: 20%

Students will be responsible for all course material up to the midterm test. The test format will be multiple choice and short answer questions, and will be 60 minutes long. You must write the test in person, at the specified time and location with the regular class (there is no online option). No accommodation will be made for students with course conflicts.

### Final exam: 45%

Students will be responsible for all course material for the entire term. The examination format will be multiple choice and short answer questions.

**Exams are written on campus:** Even though you have the option to treat this like an online course, the final exam must be written in person on the St. George campus during the exam period.

**Note:** should an unexpected technical issue with university system availability or functionality arise, it may be necessary to revise the timing or weighting of the assessments.

## Lectures (Live with Simultaneous Webinar)

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**Tuesday 1:10-3:00, Sidney Smith Hall, room 2125.**

You have the option of attending each lecture in person, online, or both.

My regular, in-class lectures will be shown live on the internet as a webinar and you will be able to ask questions in real time using a chat window. I will do my best to monitor this during class, and answer questions just as I would if someone were in class and raised their hand. The webinars are recorded and made available online afterwards.

**Note:** please remember that this is something I offer for your convenience, and do not guarantee availability if there are technical difficulties.

The PowerPoint slides used in class will be made available online as PDF files for students to download prior to each lecture. However, please keep in mind that these files are designed to be part of a presentation. They are not complete lecture notes or study notes; in fact, they often won't make a lot of sense on their own and are definitely not a substitute for attending class and/or watching the lecture recordings. You will learn much more effectively if you augment the lecture slides with your own notes.

### Lecture/webinar FAQ:

**What will I see online?** You will see whatever is shown using the projector in class - mainly PowerPoint slides, but also any software demonstrations or websites that are shown. Usually, there will not be video of the instructor, but you will hear me talking (so you may want to use earbuds/headphones). No audio or video of students will be intentionally captured or recorded (although sometimes students asking questions are inadvertently recorded by my microphone). Any questions asked by students in the lecture hall will be repeated by the instructor for the benefit of those watching online.

**How do I access the live webinar?** At any time during the lecture, go to the link above, select "Enter as a Guest" and type in a screen name (this can be whatever you want, but I strongly encourage you to use your real name so we can all get to know each other; it will appear when you enter the webinar "room" and will be part of the recording). The webinars will be conducted with Adobe Connect software and should be accessible from any web browser (you may have to install a browser plug-in) and on most devices (you may have to download an Adobe Connect app for your phone or tablet).

**How do I ask a question in the webinar?** Just type your question into the chat window and click the Enter key on your keyboard. You can use the "Set status" drop-down menu at the top of the window to raise your hand or provide other feedback (e.g., speed up, slow down), but this is optional and not expected. Microphone and video questions are not available during the lectures, but can be used during office hours.

**How do I see a recording of the webinar later?** The entire webinar will be recorded and will be made available through a URL link shortly after class in the usual "Lectures" section of the Course Materials.

## GIS Assignments and Lab Sessions

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**Lab sessions:** Tuesday, 3:10-5:00 or Wednesday, 1:10-3:00

Unlike GGR272 and GGR273, there are lab sessions in this course. You are expected to attend the session times that you signed up for on ACORN (attendance is not mandatory). If you wish to drop in on the other lab session, please ask the TA if there is room – if there is, you are welcome to sit in.

## Options for Using the GIS Software

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To complete the assignments, you will need to use ArcGIS for Desktop 10.2 or newer (Advanced version) made by [ESRI Inc.](#) You have several options for accessing ArcGIS. The "default" option is to use the computers in the GIS Lab, since you are able to complete all of your work for this course using those computers. For your convenience, you also have the options of installing ArcGIS on your own computer and/or running it virtually through a web browser. Please note that you are responsible for ensuring that you have access to ArcGIS using one of these methods. **Encountering a technical problem using any option other than the GIS Lab is not a valid reason for an assignment deadline extension.** If you do run into problems, check the FAQ page on the discussion board and, if needed, post a question so that we can resolve the problem as quickly as possible.



### Use ArcGIS in the GIS Lab

The GIS Lab is in Sidney Smith Hall room 620, on Level "G", one floor below street level. You will have to login using a geography account (not your UTorID). Your account will be set up before the course starts. Instructions for using the GIS Lab are available on Blackboard as a PDF document. You can use the computers during scheduled Help Desk hours, and check the lab schedule on the GIS lab room door for other times that the room is available for general use.

### Install ArcGIS on your own computer

**PC:** Students can download and install a free, one-year student edition of ArcGIS on a Windows computer. Since all of the assignments and data will be available for download from Blackboard, many students find this to be a convenient option. You can download the software from the University of Toronto Map and Data Library [here](#) and if you need installation assistance, contact [gis.maps@utoronto.ca](mailto:gis.maps@utoronto.ca). An internet connection is not required to run ArcGIS once it is installed.

**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 how to install ArcGIS on a Mac, go to <http://edcommunity.esri.com/software-and-data/mac-os-support>.

### Run ArcGIS over the Internet

If you are unable to install ArcGIS on your own computer (or just prefer not to), you have the option of running it over the internet. Using XenApp by Citrix, your ArcGIS session runs remotely on a server, and you interact with it using a "thin client" window that can be used on a Mac or PC with nothing to install on your computer other than the small and simple Citrix Receiver (and Windows is not required if you're using a Mac). An internet connection is required in order to use ArcGIS via Citrix. Instructions on how to get started with Citrix can be found by clicking on the GIS Software menu link in Blackboard.

**Note:** Before using Citrix, you will need to verify your UTorID by going to this [web page](#) . You have to do this even if you have previously activated your UTorID, (you will only have to do this once).

You will find the course data on the N: drive in Citrix, and your student workspace (where you can save your files) is the G: drive. Remember that, in order to access any drive in ArcMap, you have to first click on the Connect Folder icon in the Catalog pane in ArcMap and select the drive.

**Note:** assignments are completed in Blackboard using a web browser. If you are using Citrix, it is best to complete your work in ArcGIS and then use a browser inside Citrix to complete the assignment.

**Warning:** you may experience slow performance if there is heavy demand on the Citrix server, such as the night before an assignment deadline. Please plan accordingly.

## Use ArcGIS in Robarts Library

The Map and Data Library (fifth floor) has 20 workstations with ArcGIS and there are another 40 computers on the fourth floor. The staff there are available to help with any problems or technical questions you may have with ArcGIS, but are not able to provide specific help with assignments.

**Note: files stored on your F: drive in the GIS Lab cannot be accessed from the library.**

## Getting Help

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Learning how to use software to complete various tasks can sometimes be challenging. The ability to work independently is a valuable skill for all GIS users, and it is important that you take advantage of all available resources, including lecture recordings and readings in the specified ArcGIS Help sections. However, if you are stuck and are not able to find a solution from the resources provided, you are encouraged to post a question to the course discussion board. Chances are that another student or a TA has encountered a similar problem and will be able to offer advice.

### Lecture questions

You are strongly encouraged to use the discussion board to ask your fellow students and/or the course instructor questions. Students sometimes feel isolated and that they have no one to talk to about the course. Don't let this happen! If you participate in conversations online, you'll have a much easier time understanding the material, keeping up, and you will likely find the course experience more enjoyable. Using the discussion board also allows other students to benefit from the discussion and dramatically improves efficiency in communication. E-mail to your TA or the instructor should only be used for personal questions, such as requests for deadline extensions due to illness.

### Assignments and technical support

- Consult the readings and podcasts found under Course Materials
- [ArcGIS Help](#), [ArcGIS online forums \(GeoNet\)](#)
- Ask your fellow students, TAs, and instructor via the discussion board (you are encouraged to ask and answer questions in the forum, keeping in mind that you cannot describe your methods or post images of your maps, or provide answers to specific assignment questions – if you need to do this, then post a [private question](#) (instructors only) to Piazza, that can only be seen by the instructor and TAs
- Ask your TA during lab sessions, through the discussion board, or during office hours

### Learner support available at the University of Toronto

The university provides a range of student support related to student life and academic success. Learner supports include services related to University Life, Library, Academic skills support, IT support and more. See [Learner Support Available at the University of Toronto](#).

### 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:

<http://geography.utoronto.ca/undergraduate/math-help/>

## Course Policies

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### Late penalty

A penalty of 5% of the total mark for the assignment will be applied per day, up to 7 days (including weekends and holidays), after which assignments will not be marked. Penalties are calculated for each 24-hour period after the deadline. If an assignment has been handed back, no other assignments will be accepted, even if it has not been 7 days.

### Technical problems

This course requires the use of computers, and many things can go wrong when using them. You are responsible for ensuring that you maintain regular backup copies of your files, use antivirus software (if using your own computer), and schedule enough time to allow for delays due to technical difficulties. Computer viruses, crashed hard drives, lost or corrupted files, incompatible file formats, etc. are common issues when using technology, and are not acceptable grounds for a deadline extension.

### In case of illness

Requests for assignment deadline extensions must be made to the instructor within five business days after the deadline, and must be accompanied by an original copy of the official university medical form. Medical forms are accepted at the discretion of the instructor, and must clearly indicate that you were incapacitated for the date of a test or for several days in the case of an assignment (being ill immediately prior to the deadline for a two-week assignment is not sufficient grounds for a deadline extension).

### Inquiries about graded term work

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.

### 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](#).

### Academic offences

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.

## Course Schedule

DATE	TOPIC	ASSIGNED	DUE <sup>1</sup>
Sept. 12	<b>Course introduction:</b> course overview, discussion of course administration <b>GIS professional development:</b> learning about GIS careers and post-graduate opportunities	NO LAB SESSIONS	
Sept. 19	<b>Global Navigation Satellite Systems:</b> how the Global Positioning System (GPS) and similar systems determine your location	GNSS (5%)	
Sept. 26	<b>Global Navigation Satellite Systems: (continued)</b> <b>Raster analysis:</b> advanced methods		
Oct. 3	<b>Raster analysis:</b> (continued)	Raster Analysis (10%)	GNSS
Oct. 10	<b>Raster analysis:</b> (continued) <b>Terrain mapping and analysis:</b> representing 3D surfaces, and determining slope, aspect, viewsheds and more		
Oct. 17	<b>Midterm test:</b> multiple choice, short answer questions on material to date		
Oct. 24	<b>Midterm test results</b> <b>Terrain mapping and analysis:</b> (continued)	Terrain Analysis (10%)	Raster Analysis
Oct. 31	<b>Surface creation and spatial interpolation:</b> using sample points to create a 3D surface using various methods		
Nov. 7	<b>READING WEEK</b> (GIS Lab is open, but no lab sessions will be held)	NO LAB SESSIONS	
Nov. 14	<b>Surface creation and spatial interpolation:</b> (continued)	Surface Creation (10%)	Terrain Analysis
Nov. 21	<b>Surface creation and spatial interpolation:</b> (continued) <b>Density surfaces:</b> simple and kernel density of point locations		
Nov. 28	<b>GIS planning and implementation:</b> how a new GIS is introduced into an organization		
Dec. 5	<b>Course review:</b> discussion of the final exam and tips on how to prepare; Q&A session regarding any topic in the course – bring your questions!	NO LAB SESSIONS	Surface Creation

<sup>1</sup> **Assignments are due at 9:00 am on the dates indicated (i.e., the morning of the lectures).**

Please keep in mind that the instructor keeps regular business hours. Emails/posts received outside of these hours will usually be replied to the next business day. The instructor reserves the right to modify the topics and schedule during the term.