GEOG*3480 GIS and Spatial Analysis (0.5 CR)

University of Guelph (Main Campus),
Department of Geography, CSAHS,
Fall 2016

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Office hours: Monday 11:30 - 1:00 and Wednesdays 11:30 - 1:00.

Prerequisite 10.00 credits, including GEOG*2480

Overview

This course is one of two 2nd year courses (the other being GEOG*3420 Remote Sensing of the Environment) 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. GEOG*3480, along with GEOG*3420 Remote Sensing of the Environment, 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 map digitizing, data query and overlay, spatial interpolation, multi-criteria evaluation, least cost pathway determination and digital elevation models. 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

There will be two lectures per week on Monday 10:30 – 11:20 PM and Wednesday 10:30 – 11:20 PM. In addition each student must attend one three-hour lab per week.

Text and Other Resources

The main recommended text for this class is:

Import Dates

Monday September 12 - First class
Monday October 10 — Thanksgiving holiday (no class)
Wednesday October 26 — Mid-term examination (in class; worth 25%)
Thursday December 1 - lecture to make up for lost Thanksgiving Monday
Friday December 16 — Final examination 07:00PM - 09:00PM, location to be announced (worth 25%)

Method of Evaluation

The lab material constitutes an integral part of this course, since this is where students receive hands on work with photographs, 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. Lab material will be covered on both the mid-term and final exams.

Grade Distribution

• Lab Assignments: 50%
• Mid Term Exam: 25%
• Final Exam: 25%

The mid-term exam will be held Wednesday October 26, 2016 in class time. The final exam is currently scheduled for Friday December 16, 07:00PM - 09:00PM, location to be determined. The final exam is NOT cumulative and will only cover topics after the cut-off point (given in lecture) for the mid-term exam.
Office Hours

If you are having difficulties with 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, please feel free to visit me during my office hours (Stated above) or e-mail me.

Lecture Topics

- A brief introduction to GIS
- Geospatial data
  - How are spatial data organized
  - Raster vs vector data structures
  - Data collection
- Data quality:
  - Accuracy and precision
  - Types of errors
  - Modifiable Areal Unit Problem (MAUP)
- Basic raster and vector data analysis
- Staticstical analysis of spatial data
  - Distance, areas, autocorrelation, point patterns, and directional (circular) statistics
- Spatial interpolation
- Terrain mapping and analysis (additional readings)
  - DEM derivatives
  - Viewsheds
  - Watersheds and other hydrological analysis
- Least-cost pathway analysis and network analysis
- GIS modelling and GIS programming
- Future considerations in the field

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 ArcGIS. 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 Teaching Assistant (TA) will make an arrangement with you regarding handing in the labs. Your TA will be available to help you during the scheduled lab times and during his or her office hours. TAs are not required to be available outside of these times! If your TA helps you outside of scheduled times, then he or she is doing you a favour.

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 ArcGIS 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.

Laboratory assignment schedule

- Lab 1 starts week of Sept. 19 (due week of Oct. 3)
- Lab 2 starts week of Oct. 3 (due week of Oct. 17)
- Lab 3 starts week of Oct. 17 (due week of Oct. 31)
- Lab 4 starts week of Oct. 31 (due week of Nov. 14)
- Lab 5 starts week of Nov. 14 (due week of Nov. 28)

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 TA 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 TA that you normally are in another lab (identify time and TA). You may not change your lab period without the permission of the instructor.

- 0101 Mon 07:00PM – 09:50PM Hutt 231
- 0102 Tues 07:00PM – 09:50PM Hutt 231
- 0103 Wed 07:00PM – 09:50PM Hutt 231
- 0104 Thur 07:00PM – 09:50PM Hutt 231

**Laboratory Fee**

There is a $30.00 lab fee associated with this course, which include $12 for the ArcGIS tutorial, $8 for the Spatial Analyst tutorial, and $10 printing credits. If you already have a copy of the ArcGIS tutorial lab manual, you may optionally not pay the lab fee associated with this manual. Similarly, if you recognize that you will not be using departmental printing services throughout the semester, you need not pay this fee. However, printing credits cannot be added to your account at a later time. Please pay the appropriate lab fee during your first lab session. Students must provide their own USB memory sticks or CDs to backup lab data.

**E-mail Communication**

As per university regulations, all students are required to check their 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**

Late assignments will be assessed a penalty of 10% per day (not including weekends). After the assignment has been handed back to the class no grade can be assigned on late work.

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**

The last date to drop one-semester courses, without academic penalty, is November 4, 2016. For regulations and procedures for Dropping Courses, see 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 of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community’s shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Student Accessibility Services (SAS) as soon as possible.

For more information, contact SAS at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: http://www.uoguelph.ca/csd/

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. An example of academic misconduct that might occur in this course is a student copying an answer or using a map/image from another student. Students must create their own digital files for computer-based exercises. 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.