

GEOGRAPHY FINAL COURSE OUTLINE: FALL 2018

GEOGRAPHY 567 GFC Hours (3-3)

Introduction to Programming in Geographic Information Systems

Section	Days	Time	Location
LEC 01	TuTh	12:30 – 13:45	ES 319
LAB 01	Mo	13:00 – 15:50	ES 307

Instructor: Darren Bender	Office: ES 338
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Please note: The appropriate emergency evacuation assembly point for classes taught in Earth Sciences is ICT Food Court.

Official Course Description:

Introduction to computer programming for customizing and automating a GIS. Topics include object-oriented programming techniques, advanced geoprocessing, scripting, and automation using a programming language such as Python or Visual Basic.

Course Overview:

This course provides an introduction to programming and is intended for students with no previous programming experience. It focuses on fundamental programming skills using the Python programming language, with particular application to GIS-related tasks within the ArcGIS software environment. Approximately one-half of the course will be spent learning general and transferable programming skills, and the second half will cover GIS-specific applications, including basic scripting, batch processing and automation of repetitive tasks, and designing complex geoprocessing tasks.

This course assumes no prior knowledge of programming. However, students are expected to understand fundamental GIS concepts. Past experience with the ArcGIS Desktop application suite is essential. At least one advanced undergraduate-level course in GIS is recommended.

Course Objectives:

Students will learn fundamental programming skills that are transferable to any object-oriented programming language and apply these skills to performing GIS-related tasks, such as geoprocessing or automation of repetitive tasks. Students will evaluate and design effective programming solutions to a variety of tasks relevant to GIS or geospatial software. Emphasis will be placed on analyzing problems and designing structured solutions, particularly using Python scripts and customized tools in ArcGIS Desktop applications. Programming concepts and coding skills will be presented from a fundamental/conceptual perspective and practiced in technically-oriented, laboratory assignments.

Course Learning Outcomes:

The Department of Geography is committed to student knowledge and skill development. The table below lists the key learning outcomes for this course, the program-learning outcomes they facilitate, and the expected level of achievement.

Course Learning Outcomes	PLO(s)	Level(s)
Recognize and describe the differences between low- and high-level programming languages and distinguish between compiled and interpreted code.	6	1
Describe data types and structures, decision structures and functions, and implement them in effective computer code to perform/automate GIS tasks.	6	2
Explain the principles of object-oriented programming (OOP) and modularization of code and implement OOP techniques in effective code.	5	2
Explain the value of the program development cycle for problem-solving and developing code solutions and implement the approach in assigned programming exercises.	4	3
Apply effective programming techniques to problem-solve geoprocessing and map automations tasks in a GIS framework.	3,4,6	3
Demonstrate the ability to analyze coding problems and undertake self-learning to develop original solutions using reference material and code examples.	3	2
Create stand-alone solutions (e.g., ArcGIS scripting tools) that enhance or expand the built-in functionality of a GIS software system using OOP code.	3,4,6,7	2

PLOs = Program Learning Outcomes: 1 = reflect and communicate diverse human-environment perspectives, 2 = identify and explain human-environment processes, 3 = implement sampling, data collection, analyses and communication methods, 4 = analyze spatial and temporal aspects of human-environment systems, 5 = employ knowledge, arguments, and methodologies for solving human-environment problems, 6 = evaluate geospatial data and manipulate it to create cartographic products, 7 = communicate geographic concepts using oral, written, graphic, and cartographic modes, and 8 = demonstrate literacy skills. **Levels:** (1) Introductory, (2) Intermediate, (3) Advanced.

Prerequisite:

Geography 357. **Notes:** Geography 457 is recommended. No previous experience with computer programming is required.

Learning Resources:

Required Text: Zandenberg, Paul A. 2013. *Python Scripting for ArcGIS*. ESRI Press, Redlands, CA. 368 pp.

Note: Readings from other sources may be assigned. Notifications of these will be posted on D2L. They will not require purchase.

Lab Assignments:

Students will undertake a series of lab assignments designed to provide hands-on experience programming with the Python programming language, particularly within the ArcGIS Desktop software. All assignments must be submitted using the Desire2Learn (D2L) system. Email submissions or submissions in other formats will not be accepted.

Term Project:

All students will complete a term project that is due on the last day of lectures. For their term project, each student will develop a custom tool using Python within ArcGIS. Term project guidelines will be provided to students' mid-way through the course. All projects must be submitted using the D2L system. Email submissions will not be accepted.

Grading (Weighting):

Students will be evaluated in two areas: their knowledge of lecture material and programming assignments/term project. All exams will be 'open-book' and will test the students' knowledge of the conceptual issues of programming and application development in GIS. The application of this knowledge will be evaluated through laboratory assignments and a term project. The distribution of marks will be:

Mid-term tests (2):	40%	(see schedule on D2L)
Laboratory assignments (5):	35%	(see assignment schedule on D2L)
Term project:	25%	(due last day of lectures)

Note: students must pass each of the components above to pass the course overall.

There is no final exam scheduled for this course.

Grading System:

96-100	A+	77-80	B	59-61	C-
90-95	A	71-76	B-	55-58	D+
86-89	A-	65-70	C+	50-54	D
81-85	B+	62-64	C	0-49	F

Administrative Policies and Procedures:

Course administrative policies and procedures related to office hours, assignments, lab submissions, online discussions, sending questions to the instructor, etc. are available on the course web page on the university D2L site at: <http://d2l.ucalgary.ca>. All students are required to familiarize themselves with course policies and procedures.

Human Subjects:

Students will not participate as subjects or researchers on human subjects in this course.

Supplementary Fees:

No supplementary fee has been assessed for this course.

For additional detailed course information posted by the Instructor, see the course D2L page online at: <https://d2l.ucalgary.ca>.

SUPPLEMENTAL INFORMATION

Writing across the Curriculum

Writing skills are not exclusive to English courses and, in fact, should cross all disciplines. The university supports the belief that throughout their university careers students should be taught how to write well, so that when they graduate their writing abilities will be far above the minimal standards required at entrance. Consistent with this belief, students are expected to do a substantial amount of writing in their university courses and, where appropriate, faculty members can and should consider quality of writing as a factor in the evaluation of student work. The services provided by Writing Support Services can be utilized by all undergraduate and graduate students who feel they require further assistance: www.ucalgary.ca/ssc/writing_support/overview.

Academic Accommodations

It is the student's responsibility to request academic accommodations, according to the university policies and procedures listed in the University Calendar.

The student accommodation policy can be found at: www.ucalgary.ca/access/accommodations/policy. Students needing an accommodation because of a disability or medical condition should communicate this need to Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities: www.ucalgary.ca/policies/files/policies/student-accommodation-policy.pdf.

Students needing an accommodation based on a protected ground other than disability should communicate this need, preferably in writing, to the Department Head (email: geograph@ucalgary.ca).

Principles of Conduct

The University Calendar includes a statement on the principles of conduct expected of all members of the university community (including students, faculty, administrators, any category of staff, practicum supervisors, and volunteers), whether on or off university property. This statement applies in all situations where members of the university community are acting in their university capacities. All members of the university community have a responsibility to familiarize themselves with the principles of conduct statement, which is available at: www.ucalgary.ca/pubs/calendar/current/k.html.

Plagiarism, Cheating, and Student Misconduct

The University of Calgary is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect.

Academic dishonesty is not an acceptable activity at the University of Calgary, and students are **strongly advised** to read the Student Misconduct section in the University Calendar at: www.ucalgary.ca/pubs/calendar/current/k-3.html. Often, students are unaware of what constitutes academic dishonesty or plagiarism. The most common are (1) presenting another student's work as your own, (2) presenting an author's work or ideas as your own without adequate citation, and (3) using work completed for another course. Such activities will not be tolerated in this course, and students suspected of academic misconduct will be dealt with according to the procedures outlined in the calendar at: www.ucalgary.ca/pubs/calendar/current/k-5.html.

Internet and electronic communication device information

There is no restriction on the use of laptops and tablets in class if they are used to take notes or find information relevant to the class and if there is no disturbance or distraction of other students or the instructor. Phones must be turned off during class, unless you have previously identified yourself to the instructor as a health care or law enforcement professional. The use of laptops, tablets, smartphones,

calculators and other electronic devices during examinations will be allowed, provided they are not used to communicate to another person.

Freedom of Information and Protection of Privacy

Freedom of Information and Protection of Privacy (FOIP) legislation in Alberta disallows the practice of having students retrieve assignments from a public place, such as outside an instructor's office, the department office, etc. Term assignments will be returned to students individually, during class or during the instructor's office hours; if students are unable to pick up their assignments from the instructor, they must provide the instructor with a stamped, self-addressed envelope to be used for the return of the assignment.

Posting of Grades and Picking-up of Assignments

Graded assignments will be returned by the instructor or teaching assistant personally during schedule lecture or laboratory periods, unless they are made available electronically through the course D2L webpage. Grades and assignments will not be available at the Department of Geography's main office.

Faculty of Arts Program Advising and Student Information Resources

Have a question, but not sure where to start? The Faculty of Arts Students Centre is your information resource for everything in Arts! Drop in at SS 102, call us at 403-220-3580, or email us at ascarts@ucalgary.ca. You can also visit the Faculty of Arts website at <http://arts.ucalgary.ca/undergraduate>, which provides detailed information about common academic concerns.

For guidance on course registration (add, drop, swap), information about paying fees, and assistance with your Student Centre, contact Enrolment Services at 403-210-7625 or visit them at the MacKimmie Block.

Contact Information for Student and Faculty Representation

- SU VP Academic Phone: 220-3911 and e-mail: suvpaca@ucalgary.ca
- SU Faculty Rep. Phone: 220-3913 and e-mail: arts1@ucalgary.ca
- The students ombudsman office information can be found at: www.ucalgary.ca/ombuds/

Wellness and Mental Health Resources

The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness, and academic success and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support, or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, <https://www.ucalgary.ca/wellnesscentre/services/mental-health-services>) and the Campus Mental Health Strategy website (<http://www.ucalgary.ca/mentalhealth/>).

Campus Safewalk

Campus Security, in partnership with the Students' Union, provides the Safewalk service, 24 hours a day, to any location on Campus, including the LRT station, parking lots, bus zones, and university residences. Contact Campus Security at 220-5333 or use a help phone, and Safewalkers or a Campus Security officer will accompany you to your campus destination.

USRI Surveys

At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses (www.ucalgary.ca/usri). Your responses make a difference, so please participate in USRI surveys.