
School of Geography & Earth Sciences
McMaster University

GEOG 4GS3: GIS Programming
September to December 2015

COURSE OUTLINE¹

Description

Advanced treatment of GIS focusing on the creation of scripts to enhance productivity by automating time-consuming and repetitive tasks. Through in-class discussions, demonstrations, and regular hands-on exercises, students are introduced to Python scripting in ArcGIS.

Learning Outcomes

Upon successful completion of this course, you will be able to:

1. Understand the fundamental components of the Python language.
2. Develop Python scripts.
3. Work with the ArcPy site package.
4. Create new script tools in ArcToolbox.

Administration

Instructor

Dr. Darren M. Scott Office: GSB 237
 Office Hours: Fri. 1:00 – 3:00 pm
 Phone: (905) 525-9140, ext. 24953
 Email: scottdm@mcmaster.ca

Lectures

This course meets three hours per week on Wednesdays from 2:30 pm to 5:20 pm in BSB 331.

Required Textbook

Zandbergen, P.A. (2013) *Python Scripting for ArcGIS*. Redlands, CA: ESRI Press.

Optional Reference Textbook

Lutz, M. (2013) *Learning Python, 5th Edition*. Sebastopol, CA: O'Reilly Media Inc.

You are expected to consult the above required text for treatments of topics covered in class. At the end of each class, the readings for the following week will be provided. To make the most of your experience, you should read this material prior to coming to class.

¹ The Instructor and the University reserves the right to change any aspect of this course outline.

Avenue to Learn

A website has been developed for this course. All registered students are automatically enrolled in the website, which can be accessed at the following web address:

<http://avenue.mcmaster.ca/>

If at any time students do not appear to be officially registered in the course, they will be denied access to the course content as well as the GIS labs (BSB 331, BSB 332).

Assessment

64% Assignments (8 assignments @ 8% each)

36% Project

Course Guidelines and Regulations

1. ***Contacting the instructor*** – I plan to adhere to regular office hours as indicated in this outline, and you are encouraged to use this time to review material, clarify points, or pursue issues. If for some reason you are unable to attend my office hours, please e-mail me for an appointment. With respect to email, I will check it once per day at approximately 9:00 am. If you are emailing outside of regular business hours (i.e., Monday to Friday 8:30 am – 4:30 pm), please do not expect a response until the next business day. Waiting for an email response does not constitute a valid reason for a late submission. Finally, I do not take technical questions over the phone.
2. ***Course preparation*** – Be advised that in general you will be required to dedicate at least 3 hours of preparation/study per hour of class. More preparation will help you make the most out of the course, and will undoubtedly lead to a higher grade. If for any reason you are having trouble with the course, come and see me as soon as possible. Problems that are identified early can often be rectified.
3. ***How the term should be viewed*** – It is reasonable to expect students to work throughout the duration of the term. Deliverables can be scheduled at any time during the term. You should consult the Course Schedule for specific dates and times. Given that attendance in both lectures and labs is mandatory, you are responsible for any missed information or instructions.
4. ***Handing in assignments*** – Eight assignments are collectively worth 64% of your final grade. Assignments must be handed in to your instructor at the beginning of your next class. Assignments handed in at any other time beyond this are considered late. Late assignments can be handed in to the internal course drop box, which is on the 2nd floor of the General Sciences Building just outside the School of Geography and Earth Sciences Main Office (GSB 206). At 16:30, the external doors to the School lock, and any assignments should be submitted to the external drop box outside the doors to the School on the west side of the 2nd floor in the General Sciences Building. Late assignments are penalized at the rate of 20% for the first day and 10% for each subsequent day they are overdue, including weekends. **Late assignments will only be graded if they are handed in no later than three days after the original submission deadline.** After this time, you will receive a grade of zero. If you are late in submitting an assignment, you must send a digital copy to me so that I will know when the assignment was completed. Please ensure that a paper copy is then submitted immediately to the drop box for grading. This copy cannot be different in any way to the digital submission. The paper copy will be graded with all late penalties applied up until the paper copy was submitted.
5. ***Mark appeals*** – I will make every effort to provide you with a grade that best reflects the quality of your work, and re-marking will be conducted at discretion. If you wish to have your work re-marked, you will be asked to explain in writing, within at most 5 business days after the work is initially returned, the reasons why it should be reviewed and the mark changed by me. A reply will be forthcoming in a period of at least 48 hours. Please note that re-marking may result in a higher or lower grade.

6. **Missed work** – If you are seeking relief for missed academic work for absences lasting up to three days, you may report your absence, once per term, without documentation, using the McMaster Student Absence Form (<http://www.mcmaster.ca/msaf/>). When using the MSAF, report your absence to your instructor (scottdm@mcmaster.ca). Once the form is filled out, contact your instructor by email (scottdm@mcmaster.ca) immediately (within one working day). You will then have three days from the due date of your assignment to submit your completed work (weekends count as two days) to the internal drop box (printed copy) and to your instructor (electronic copy). Handing in an assignment after this will result in a grade of zero. Absences lasting more than three days must be reported to your Faculty Office.
7. **Students with special needs** – If you have (or suspect you may have) a learning disability that may require accommodations, you are advised to contact Student Accessibility Services (McMaster University Student Center Basement, Room B107, Tel. 905-525-9140, ext. 28652). Accommodations are arranged exclusively through Student Accessibility Services (<http://sas.mcmaster.ca/>).
8. **Academic dishonesty** – All students are reminded of the seriousness of academic dishonesty. Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university. It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy (specifically Appendix 3, located at <http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf>). Plagiarism (e.g., the submission of work that is not one’s own or for which other credit has been obtained), improper collaboration in group work and copying or using unauthorized aids, tests and examinations are examples of academic dishonesty.
9. **The Instructor and the University reserves the right to change any aspect of this course outline.**

Prerequisites

A minimum grade of B in one of EARTH SC 3GI3, 3GV3, 4GI3, ENVIR SC 3GI3, 3GV3, 4GI3, GEOG 3GI3, 3GV3, 4GI3

Lab and Software Ownership Policies

As part of this course, you will complete assignments using ArcGIS 10.5.1. McMaster University has obtained an Academic site license from ESRI Canada Limited, which means that the license limits the use of the software to academic purposes only (i.e., you cannot use it for commercial purposes). Students who wish to have a student version of ArcGIS 10.3.1 can obtain one for a \$30 administrative fee. This version of the software has the same functionality as the version in the GIS Labs and it times out after one year.

In addition to the use of ArcGIS, you are advised that the data used in the course for the preparation of assignments may be subject to the proprietary rights of others. You must obtain appropriate permissions to use any such data for purposes other than the completion of assignments.

You are urged to discuss any concerns that you may have with your instructor. In no event will McMaster University be responsible for the use by a student of any data for which appropriate permission was not obtained. By taking part in this course, you agree to indemnify McMaster University from any loss that may be suffered on its part as a result of you not obtaining appropriate permission.

Course Schedule (Subject to change at the discretion of the instructor)

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|-------------------|---------------------------------------------------------------------|
| Week 1 | |
| Sept. 6 | Getting Started |
| Reading | Zandbergen: Chapters 1, 3; Lutz: Chapters 1, 3, 4 |
| Assignment | No assignments this week |
| Week 2 | |
| Sept. 13 | Data Types |
| Reading | Zandbergen: 4 (4.1 – 4.8, 4.12, 4.13); Lutz: Chapters 4, 5, 6, 7, 8 |
| Assignment | Assignment 1: Working with Integers, Strings, and Lists |
| Week 3 | |
| Sept. 20 | Controlling Workflow |
| Reading | Zandbergen: Chapter 4 (4.16, 4.17); Lutz: Chapters 12, 13 |
| Assignment | Assignment 2: Controlling Workflow |
| Week 4 | |
| Sept. 27 | Project Discussion Text Files and User Input (1) |
| Reading | Zandbergen: Chapters 4 (4.18), 7 (7.6); Lutz: Chapter 9 |
| Assignment | Assignment 3: Text Files and User Input |
| Week 5 | |
| Oct. 4 | Text Files and User Input (2) |
| Reading | Zandbergen: Chapters 4 (4.18), 7 (7.6); Lutz: Chapter 9 |
| Assignment | Assignment 3: Text Files and User Input (cont.) |
| Week 6 | |
| Oct. 11 | Midterm recess (no class) |
| Week 7 | |
| Oct. 18 | Geoprocessing with ArcPy |
| Reading | Zandbergen: Chapter 5 |
| Assignment | Assignment 4: Geoprocessing with ArcPy |
| Week 8 | |
| Oct. 25 | Exploring Spatial Data |
| Reading | Zandbergen: Chapter 6 |
| Assignment | Assignment 5: Exploring Spatial Data |
| Week 9 | |
| Nov. 1 | Manipulating Spatial Data |
| Reading | Zandbergen: Chapter 7 (7.1 – 7.5) |
| Assignment | Assignment 6: Manipulating Spatial Data |
| Week 10 | |
| Nov. 8 | Geometry (1) |
| Reading | Zandbergen: Chapter 8 |
| Assignment | Assignment 7: Working with Geometries |

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|-------------------|---------------------------------------------------------------|
| Week 11 | |
| Nov. 15 | Geometry (2) |
| Reading | Zandbergen: Chapter 8 |
| Assignment | Assignment 7: Working with Geometries (cont.) |
| Week 12 | |
| Nov. 22 | Working with Rasters |
| Reading | Zandbergen: Chapter 9 |
| Assignment | Assignment 8: Working with Rasters |
| Week 13 | |
| Nov. 29 | Creating Customized Tools in ArcGIS (Demo) Work on project |
| Reading | Zandbergen: Chapter 13 |
| Week 14 | |
| Dec. 6 | Work on project |
| Reading | No readings this week |
| Assignment | No assignments this week |