

GEOG 1180: Introduction to Geo-programming

Course Syllabus (Fall 2023)

Instructor

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Office Hours: Monday & Wednesday 10:00 AM – 11:00 AM,
Thursday 12:30 PM – 1:30 PM, or by appointment

Prerequisites

No prior programming experience is required.

Course Format

GEOG 1180 is a 3-credit hybrid course. Lectures are posted online and lab sections are on-campus (Thursday 10:45 AM – 12:05 PM or Thursday 2:00 PM – 3:20 PM in GC 1855). Expect to spend up to 3 hours per credit on this course (9 hours per week), depending on your programming background.

Course Overview

Contemporary research in analytical geography has placed an increasing demand on the computational skills of its practitioners. The advances in spatial data analysis and geographical modeling have also largely out-paced the capabilities of standard statistical software. At the same time, the multidisciplinary nature of the spatial sciences often translates into the need to deal with disparate data sources, formats, and programming languages. As such, students undertaking research confront a challenging set of tasks seldom covered in an integrated fashion. This course addresses this need.

Course Description

This course is an introduction to geo-programming using the Python language as it pertains primarily to manipulating and analyzing geographic information. Broadly, the course will cover: 1) basic programming concepts, 2) principles and good practice in computer programming, 3) the Python language, 4) geo-programming concepts, methods, and approaches, and 5) a survey of geographic problems. Lectures and exercises provide a basis for labs involving hands-on programming or scripting.

Course Objectives and Scope

1. Introduce students to basic computational concepts using Python, an object-oriented scripting language, for data processing, analysis and application development.
2. Familiarize students with the fundamental concepts and tools in manipulating and analyzing geographic information.
3. Provide students with introductory skills that are needed in higher level GIScience and commercial GIS development.

Required Textbook

Downey, Allen B. 2015 (2nd Edition). [*Think Python: How to Think Like a Computer Scientist*](#), O'Reilly. (ISBN-13: 978-1491939369)

Additional readings and supplementary material will be assigned via Canvas throughout the semester.

Required Software

[Python 3.x](#) and an associated Integrated Development Environment (IDE) are required for this course (ex., default [IDLE](#), [Wing](#), [PyCharm](#)). You are strongly encouraged install Python and an IDE on your own desktop or laptop for this course.

Assessment

- There are **10 required lab assignments** (70% total, 7 points each).
- There are **10 quizzes** (30%, 3 points each).
- There are **2 optional extra credit lab assignments** based on advanced topics in this course. Each extra credit assignment can **replace** either one quiz score or one assignment score (i.e. whichever combination helps you the most).

Assignments

All assignments will be submitted via Canvas. Completing each lab assignment is essential for student success because the skills covered in each assignment are required in subsequent assignments. Late assignments will be reduced 10% of the assignment value for each day late (i.e. 0.7 points per day for 7-point assignment). Assignments are due by 6:00 PM on Thursdays.

Quizzes

The quizzes, accessed in Canvas, are based on the week's lecture slides, readings, and exercise(s). You will have 15 minutes to complete a quiz from the time you start. Quizzes close at 9:00 PM on Thursdays.

Course Structure

Lecture and Reading

As this is a hybrid course, there will not be live lectures in the traditional sense. Just like in a traditional course, however, you are expected to keep up with the class schedule by reviewing the lecture slides and following the course outline below. There will be a weekly interactive lab with the instructor where you will have the opportunity to ask questions, receive guidance in completing assignments, and further explore each topic.

Exercises

The first seven weeks cover Python programming basics. The exercises are designed to help you better understand and apply the concepts in the lecture slides. While the exercises are not scored, they are critical in helping you successfully finish each weekly assignment and quiz. You are expected to complete the exercises **before** attending lab.

Lab

Each lecture corresponds with a lab assignment. Each lab section is 80 minutes and allows you to work on the weekly assignment, ask questions about the material presented, and seek assistance.

Canvas use

All announcements will be posted via Canvas. **It is your responsibility to log in to the Canvas course website frequently;** you are encouraged to set up email forwarding to ensure you receive important messages in a timely manner.

Course Schedule

This schedule may change, so always check the course website for the latest schedule.

Reading assignments refer to the textbook unless otherwise indicated.

<u>Week</u>	<u>Lecture</u>	<u>Quiz, Exercise, Lab</u>	<u>Reading</u>
Week 1 21 Aug	Course overview and introduction to geo-programming	Exercise 0: Course intro and Python configuration, Download and install software	Chapter 1
Week 2 28 Aug	Python programming basics: Variables, Operators, and Statements	Quiz 1 Exercise 1: Variables, Operators, and Statements Assignment 1: Calculating Manhattan distance	Chapter 2
Week 3 4 Sep	Python programming basics: Conditionals	Quiz 2 Exercise 2: Conditionals Assignment 2: Building a simple zonation system	Chapter 5
Week 4 11 Sep	Python programming basics: Loops I	Quiz 3 Exercise 3: While Loops Assignment 3: Summation	Chapter 7 Chapter 8.7
Week 5 18 Sep	Python programming basics: Lists and Loops II	Quiz 4 Exercise 4: Lists and For Loops Assignment 4: Identifying neighbors	Chapter 10
Week 6 25 Sep	Python programming basics: Strings	Quiz 5 Exercise 5: Strings Assignment 5: Calculating distance between counties in Utah	Chapter 8
Week 7 2 Oct	Python programming basics: Functions	Quiz 6 Exercise 6: Functions Assignment 6: Functionizing Assignments 2 & 4	Chapters 3 & 6
Week 8 9 Oct	No Class, Fall Break		
Week 9 16 Oct	Centroid and Slope	Quiz 7 Assignment 7: Calculating mean centroids and ski run slope	Smith, Goodchild, Longley: Chapter 4.2.5 (Centroids and centers) and 6.2.1.1 (Slope)

Week 10 23 Oct	Shape and Minimum Bounding Rectangles (MBRs)	Quiz 8 Assignment 8: Calculating shape index	Smith, Goodchild, Longley: Chapter 4.2.8 (Shape) and 4.2.13.3 (Minimum Bounding Rectangles (MBRs))
Week 11 30 Oct	Spatial Interaction	Quiz 9 Assignment 9: Calculate the breaking point of trade areas	Harrington
Week 12 6 Nov	Location Analysis	Quiz 10 Assignment 10: Location analysis	Smith, Goodchild, Longley: Chapter 7.4.1 (Location problems)
Week 13 13 Nov	Advanced Topics: Files and Modules	EC Exercise 1: File input/output EC Assignment 1: Binary contiguity relationships	Chapter 14 & 15
Week 14 20 Nov	Debugging in Python	No Class, Thanksgiving Break	Appendix A
Week 15 27 Nov	Advanced Topics: Graphical User Interfaces (GUIs) with Tkinter	EC Exercise 2: Tkinter EC Assignment 2: Building a simple data entry system	Chapter 19
Week 16 4 Dec	Complete and submit EC Exercise 2		

Additional Information

Scheduling Conflicts

Please speak with the instructor within the first two weeks of class regarding any known conflicts you may have with the course schedule.

Academic Integrity

The University of Utah is committed to nurturing academic excellence, truth, honesty, and personal integrity. The faculty expects all students to maintain high ethical standards. Academic misconduct will not be tolerated. Penalties may include failure of an assignment, or possibly the entire course, and the filing of formal charges with appropriate university authorities. Academic misconduct includes, but is not limited to, cheating, misrepresenting one's work, and plagiarism: As stated in the [Student Code](#); "Academic misconduct' includes, but is not limited to, cheating,

misrepresenting one's work, inappropriately collaborating, plagiarism, and fabrication or falsification of information, as defined further below. It also includes facilitating academic misconduct by intentionally helping or attempting to help another to commit an act of academic misconduct.”

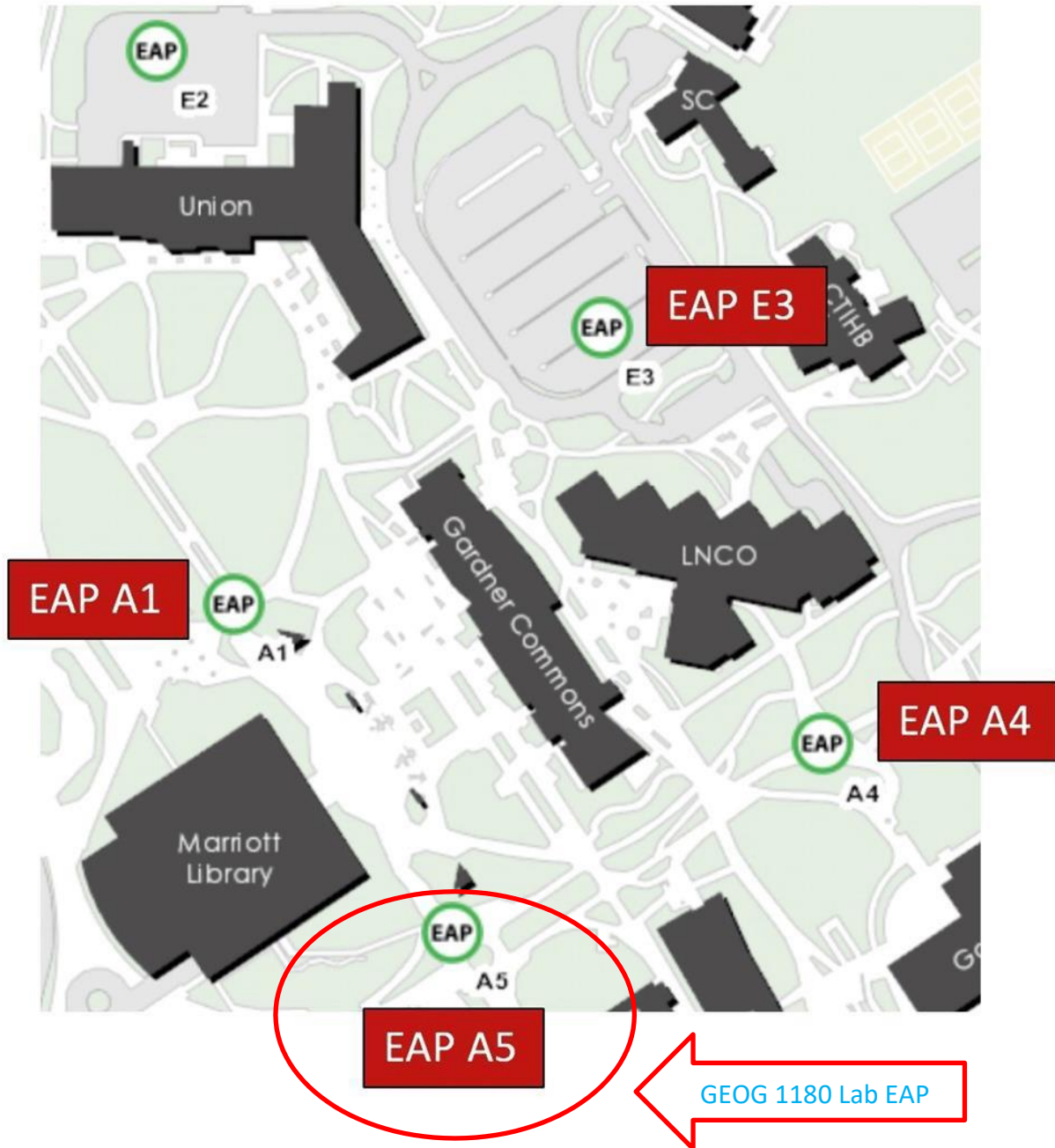
- “‘Cheating’ involves the unauthorized possession or use of information, materials, notes, study aids, or other devices in any academic exercise, or the unauthorized communication with another person during such an exercise.”
- “Misrepresenting one's work includes, but is not limited to, representing material prepared by another as one's own work, or submitting the same work in more than one course without prior permission of both faculty members.”
- “‘Plagiarism’ means the intentional unacknowledged use or incorporation of any other person's work in, or as a basis for, one's own work offered for academic consideration or credit or for public presentation. Plagiarism includes, but is not limited to, representing as one's own, without attribution, any other individual's words, phrasing, ideas, sequence of ideas, information or any other mode or content of expression.”
- “‘Fabrication’ or ‘falsification’ includes reporting experiments or measurements or statistical analyses never performed; manipulating or altering data or other manifestations of research to achieve a desired result; falsifying or misrepresenting background information, credentials or other academically relevant information; or selective reporting, including the deliberate suppression of conflicting or unwanted data. It does not include honest error or honest differences in interpretations or judgments of data and/or results.”

This course has a zero-tolerance policy for academic misconduct. For any coursework in which it is demonstrated that a student engaged in academic misconduct the resulting academic sanction will be a score of zero for the coursework. Additionally, the student will be required to meet with the academic advisor from the Department of Geography and/or your respective department, and a [Public Incident Report](#) detailing the instance of academic misconduct will be submitted to the university. See the Student Code for additional information on academic sanctions.

Disability Accommodation

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the [Center for Disability & Access](#), 162 Olpin Union Building, 581-5020 (V/TDD). CDA will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in alternative format with prior notification to the Center for Disability & Access.

Emergency Assembly Point for Lab Sections



Safety & Wellness

Your safety is our top priority. In an emergency, dial 911. Report any crimes or suspicious people to 801-585-2677; this number will get you to a dispatch officer at the University of Utah [Department of Public Safety](#) (DPS). If at any time, you would like to be escorted by a security officer to or from areas on campus, DPS will help — just give a call. For more information regarding safety and to view available training resources, including helpful videos, visit [SAFEU](#).

The University of Utah seeks to provide a safe and healthy experience for students, employees, and others who make use of campus facilities. In support of this goal, the University has established confidential resources and support services to assist students who may have been affected by harassment, abusive relationships, or sexual misconduct. A detailed listing of University Resources for campus safety can be found on the Office of the Registrar's [Campus Safety / Responding to Harassment](#) page.

Your well-being is key to your personal safety. If you are in crisis, call [Community Crisis Intervention & Support Services](#) at 801-587-3000; help is close.

The university has additional excellent resources to promote emotional and physical wellness, including the [Counseling Center](#), the [Center for Campus Wellness](#), and the [Women's Resource Center](#). Counselors and advocates in these centers can help guide you to other resources to address a range of issues, including substance abuse and addiction.

Note: The syllabus is not a binding legal contract. It may be modified by the instructor when the student is given reasonable notice of the modification, particularly when the modification is done to rectify an error that would disadvantage the student.