Geography 5223: Design and Implementation of GIS

Spring 2024

Location: Online
Date and time: Asynchronous Course URL: http://carmen.osu.edu

Instructors
Prof. Ningchuan Xiao | xiao.37@osu.edu
Ms. Meera Patel | patel.4062@buckeyemail.osu.edu

Office hours

Day	Time and link	Instructor
Monday	12 - 1	Dr. Xiao
Tuesday	12:30 - 1:30	Ms. Patel
Wednesday	12 - 1	Dr. Xiao
Thursday	12:30 - 1:30	Ms. Patel
Friday	12:30 - 1:30	Ms. Patel
Friday	12 - 1	Dr. Xiao

This course covers a wide range of topics in developing GIS software tools. There are two main themes of this course. First, we introduce techniques that will help students build custom tools to automate spatial data handling processes, including topics of programming skills, software testing, and verification. The second theme of this course is about project management for GIS software development. More specifically, we discuss how agile methods can be applied for software development projects. The course is organized around a set of coding tutorials, lectures, projects, and discussions. It is mostly a project-oriented course, where each major coding topic will end with finishing a project using the concepts covered, and there is also a final project. Upon completion of this course students will be able to

- Write code to implement GIS tools in open-source and commercial GIS,

- Put together code for the tasks of GIS customization,
- Understand the fundamentals of agile project management, and
- Manage a GIS tool development project.

How this course works

This course is divided into weekly modules and each module is released at the beginning of the week. A module is organized around a specific topic and may consist of coding tutorials, readings, and other activities. The final project is a long-term process that starts at the beginning of the semester and continues through a set of major steps during the semester.

Texts

The following textbook is required for this course:

- *Agile Project Management For Dummies*, (3rd Ed.) by Mark C. Layton and Steven J. Ostermiller, John Wiley & Sons, Inc., 2020.

The following two textbooks are optional:

- *Python Scripting for ArcGIS Pro*, by Paul A. Zandbergen, ESRI Press, 2020.
- *Advanced Python Scripting for ArcGIS Pro*, by Paul A. Zandbergen, ESRI Press, 2020

In addition to the textbooks, we will provide tutorials to cover topics of tool development in QGIS and ArcGIS Pro.

Technology

In addition to the commonly used software, each student should install the following software packages on their own computer:

- ArcGIS Pro. The university has site license and detailed information about how to download, install, and set up ArcGIS Pro can be found at this page: https://guides.osu.edu/esri/arcgis-pro. You will need an updated Windows Operating System to run ArcGIS Pro.
- QGIS. This is an open-source system. Please visit https://qgis.org/en/site/ for details about how to download and install it.

- The Department may have a limited number of Windows remote desktops. If you need to use it, please contact me in the first week of class. Please note there is no guarantee that everyone will have access to it. This service is a web-based application and the performance may not be optimal.

Prerequisites

Geography 5222 or consent of instructor.

Credit Hours

This class is for 3 credits.

Schedule

The detailed course schedule is presented on the front page of the Carmen site. In general, the course is roughly divided into the following topics:

Week 1-2: Introduction
Week 3: Getting started with arpy and qgs
Weeks 4-5: Spatial data
Week 6: Geoprocessing
Weeks 7-8: Tools
Week 9: Interactivity
Week 10: Spring break (no class)
Weeks 11-13: Agile project management
Week 14: Mapping
Week 15: Final projects

Grading

Assignment category	Weights
Module exercises	25
Market share analysis tool (MSAT)	25
Final projects	25
Auto quizzes	10

Assignment category	Weights
Quizzes	10
Participation	5
Total	100

Course organization and assignment information

- **Module exercises.** Each module includes some questions that reflect what is covered in that module. These exercises are typically due in a week.
- **Market share analysis tool (MSAT).** This is a project that every student will work starting from the beginning of the semester. The ultimate goal here is to build a tool in ArcGIS Pro and QGIS to conduct market share analysis, using the public libraries in Franklin County as an example. We will start from the manual process in these systems and then eventually built the complete tools. Manual calculation will be introduced in the first two weeks, and the final submission of the tools will be due in week 14.
- **Final projects.** Students form teams, each working on a GIS development project. A typical team has no more than 4 students. Conducting the final project is a semester long process, where formal deliverables such as a video presentation and/or document are required at each of the steps. Some of these videos and documents will also be peer reviewed. At the end of the semester each project should be concluded by (a) delivering the final product including the full set of documents, software, and necessary data, and (b) making professional presentations about the project to the class. Teams that do not deliver the complete package on time will not receive any credit for the project.
- **Participation.** Each student will peer review different presentation videos and other final project through the semester. Participation in these peer reviews are counted toward the participation.
- **Auto Quizzes.** There will be three online quizzes, at weeks 1, 6 and 9, respectively. These are timed, open-book quizzes that will be automatically graded and students can take them anytime during the week the quiz is scheduled. All questions in the first auto quiz must be answered. Questions in the second and third quizzes are randomly drawn from a pool and students can have three attempts. The highest score will be used as the final score of each quiz.

- **Quizzes.** There will be two open-book, timed coding quizzes for this semester, focusing on Python for ArcGIS Pro and QGIS, respectively.

Faculty feedback and response time

I am providing the following list to give you an idea of my intended availability throughout the course. (Remember that you can call 614-688-HELP at any time if you have a technical problem.)

- **Grading and feedback:** For large weekly assignments, you can generally expect feedback within 7 days.
- **Email:** I will reply to emails within 24 hours on school days.
- **Discussion board:** The discussion board called Class Cafe is meant for students to ask questions and share experiences. I will check and reply to messages in the discussion board every Monday, Wednesday, and Friday on school days. I also encourage everyone to respond to questions whenever you can.

Important Class Policies

- **Lab computers**. The computers in the classroom as well as the remote desktops will have all the software installed for this class. Every student should be able to log in any computer with their OSU credentials. Please note that WE ARE NOT RESPONSIBLE FOR FILES LEFT ON LAB MACHINES. Files on the computer hard drive may be deleted at any time if needed. Students should use USB devices or Cloud storage to save their work. It is important to LOG OUT when you are done with the work so other people can use the computer.

- **Submissions**. All submissions must be done on Carmen (unless otherwise specified). There will be **absolutely no email submissions**. Email submissions of work for this class will not be acknowledged and will not be accepted.

- **Late submissions**. Late submissions may be accepted up to a week past the due date. One day late will incur a 10% penalty. Two days late will incur 20% penalty. Three days will incur a 30% penalty. Four days late will incur a 40% penalty. Five to seven days late will only receive 50% credit of the grade you would have received if it was submitted on time. If you contact me **prior to the due date** for deadline adjustments you will not incur any penalty. Please note this may not apply to every assignment. The final project, for example, has a firm deadline that cannot be changed.

- **Do your own work**. Collaboration is healthy and often necessary, but each student should definitely finish the work individually. Please see below for more information about academic misconduct.
- **Communication**. The only official way to communicate with me and the TA is through our OSU email address as listed on the top of the syllabus. We cannot guarantee that we will reply messages through any other methods. We normally will reply emails in a day (except weekends or holidays).
- **Alternative course delivery**. Should in-person classes be canceled due to weather or other short-term closing, we will meet virtually via CarmenZoom during our regularly scheduled time. I will share any updates via CarmenCanvas announcement.

Students with Disabilities. I would like to hear from anyone who has a disability that may require some modification of seating, testing, or other class requirements so that appropriate arrangements may be made. Please talk with me after class or during my office hours. If you need more information about disabilities and accommodations, contact the Office of Disability Services.

Policy on Plagiarism and Academic Misconduct. If I suspect that a student has committed academic misconduct in this course, I am obligated by University Rules to report my suspicions to the Committee on Academic Misconduct. In the Code of Student Conduct, academic misconduct is defined as "any activity that tends to compromise the academic integrity of the university, or subvert the educational process"; plagiarism is defined as "the representation of another's work or ideas as one's own; it includes the unacknowledged word-for-word use and/or paraphrasing of another person's work, and/or the inappropriate unacknowledged use of another person's ideas."

Plagiarism is wrong and should be prohibited. The University has a policy on academic misconduct and plagiarism, as provided in the Code of Student Conduct. To further understand this, it is worthwhile to read and understand the Eight Cardinal Rules of Academic Integrity at here and guidelines to avoid plagiarism at here.

Religious accommodations. It is Ohio State's policy to reasonably accommodate the sincerely held religious beliefs and practices of all students. The policy permits a student to be absent for up to three days each academic semester for reasons of faith or religious or spiritual belief. Students planning to use religious beliefs or practices accommodations for course requirements must inform the instructor in writing no later than 14 days after the course begins. The instructor is then responsible for scheduling

an alternative time and date for the course requirement, which may be before or after the original time and date of the course requirement. These alternative accommodations will remain confidential. It is the student’s responsibility to ensure that all course assignments are completed.