

University of Maryland at College Park
Department of Geographical Sciences
GEOG 476: Object-Oriented Computer Programming for GIS

Instructor: Cheng Fu
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Office hours: TBA
Schedule of Classes
W 2:00pm - 4:30pm LEF 1124

General information about the course

Expands on conceptual and practical aspects of programming for geographic applications. The main focus of this course is to provide students more advanced programming in object oriented programming languages (i.e. Python). In addition, students will develop a proficiency in applying these advanced programming principles to manipulating spatial data sources within the Geographic Information Systems (GIS).

Prerequisite: GEOG373 and GEOG376; or permission of BSOS-Geography department. And must have completed or be concurrently enrolled in MATH220, MATH130, or MATH140. Restriction: Must be in Geography program; or must be in GIS minor. Credit only granted for: GEOG498G or GEOG476. Formerly: GEOG498G.

Learning outcomes for the course

Upon a successful completion of the course, the students will be able to:

1. Understand object-oriented analysis and design
2. Design and implement an object-oriented project using an object-oriented programming language (Python)
3. Use open-source GIS packages in Python to solve spatial problems

Course materials

Required textbook: NO textbook is required for this course

Recommendation reading:

McLaughlin, Brett D. (2006) *Head First Object Oriented Analysis and Design* ISBN-13: 978-0596008673

Web sources:

Interactive Python tutorial: <https://www.codecademy.com/learn/python>

UML:

<http://www.ibm.com/developerworks/rational/library/content/RationalEdge/sep04/bell/>
<https://msdn.microsoft.com/en-us/library/dd409437.aspx>

Course communication

The main course communication will be carried out via the **Canvas** within the University of Maryland Enterprise Learning Management System (**ELMS**; <https://elms.umd.edu>). All students enrolled in the course have access to the system. In addition to communications, Canvas will be used by the instructor to post assignments and grades and by the students to submit their assignments.

Class structure

One typical class includes 60 mins lecture session, 30 mins group discussion and 60 mins lab session.

Lecture component

Attendance for classes is required and will be recorded during the lecture.

Group discussions

Students in the course will be asked to participate into two-three-member group discussion / work to accomplish practices. The practice will focus on designing systems and drawing charts. Problems will be given in class.

Lab component

This course has a lab component. Lab exercises will be design and coding that relative to the lecture given in class. Students will work independently to practice design and coding skills. All deliverables as listed in each lab assignment should be submitted to the Canvas weekly before due. Labs will contribute 40% to the final grade. There will be 10 labs and each lab accounts 4% of the final grade.

Please note that lab presence is mandatory, and lab presence implies that you should be physically in the lab for the entire duration of your lab hours and you must be working on the current lab assignment for GEOG476.

Provisional outline of topics covered in the course and exams

Note: modification might be introduced to the schedule as the semester progresses. Updated schedules will be made available to all students via Canvas as soon as possible.

Key Dates		Event	Topic
Week1	Wed. Jan. 27	Lecture 1	Introduction, review basic python
		Lab 1	Practice basic python on Codecademy
Week 2	Wed. Feb. 3	Lecture 2	Structural programming and data structure
		Lab 2	Practice structural programming on Codecademy
Week 3	Wed. Feb. 10	Lecture 3	Intro. to Object-oriented concepts (1)
		Lab 3	Design and implement classes in Python
Week 4	Wed. Feb. 17	Lecture 4	Intro. to OO concepts (2)
		Lab 4	Design and implement class relations in Python
Week 5	Wed. Feb. 24	Lecture 5	Make your code work: use case, test-driven, and debugging

		Lab 5	Practice debugging
Week 6	Wed. Mar. 2	Lecture 6	Principles of OO design
		Lab 6	Practice design principles
Week 7	Wed. Mar. 9	Lecture 7	MIDTERM
Week 8	Wed. Mar. 16		SPRING BREAK
Week 9	Wed. Mar. 23	Lecture 8	OO design in GIS
		Lab 7	Practice: implement a Star War command system (1) – a console version
Week 10	Wed. Mar. 30	Lecture 9	Matplotlib and Shapely(1)
		Lab 8	Practice: implement a Star War command system (2) – a panel version
Week 11	Wed. Apr. 6	Lecture 10	Shapely(2) and Fiona
		Lab 9	Practice: Make a shapefile using Fiona
Week 12	Wed. Apr. 13	Lecture 11	Introduction to index and spatial index
			Project proposal presentation
Week 13	Wed. Apr. 20	Lecture 12	Present spatial-temporal data
		Lab 10	Practice: Matplotlib 3D and animation
Week 14	Wed. Apr. 27	Lecture 13	Introduction to QGIS
			Practice QGIS
Week 15	Wed. May. 4	Lecture 14	Project presentation
	TBD		Final Exam

Mid-term and final exams

The course includes 2 non-cumulative exams: 1 mid-term exam and 1 final exam, each accounts 20% in final grade. Both exams will be “closed book” and will present a combination of design and implementation (in pseudocode). The goal is to test students’ skill to apply concepts and principles from previous classes to solve problems.

Exam make up policy

Students unable to take the test should notify the instructor at least 3 working days before the scheduled exam date to schedule a make-up date. The make-up exam must be taken within a week of the scheduled exam date. Failure to take the make-up exam or schedule a make-up date will result in a **zero** on the exam.

Final project

Final project will present a combination of in-class and out-of-class work and assessment. It will be a team-work with no more than 3 people. Various components of the final project will be graded independently and will produce a single cumulative grade for the final project (100 points worth – 20% of the total grade for the course). The components of the project and their contribution to the individual grade are as follows: 1) in lab program design (25 points) – a short in-lab presentation and a design report, and 2) actual implementation (code, 75 points).

Grade determination

The total grade in the course will be comprised of the grades for the mid-term exam (15%), the final exam (20%), the course project (15%), 10 labs (50%). The general guidelines for letter grades will be as follows: 97 ≤ "A+" ≤ 110, 93 ≤ "A" < 97, 90 ≤ "A-" < 93, 87 ≤ "B+" < 90, 83 ≤ "B" < 87, 80 ≤ "B-" < 83, 77 ≤ "C+" < 80, 73 ≤ "C" < 77, 70 ≤ "C-" < 73, 67 ≤ "D+" < 70, 63 ≤ "D" < 67, 60 ≤ "D-" < 63, 60 < "F". Minor adjustments may be introduced to the general scheme to allow for students grade distribution.

Expectations of students in the class

Class attendance is required. Students should be aware that most of the material covered in the class is not available in the optional textbook and will be presented in lectures only. Students are strongly encouraged to take careful notes during the lectures.

Students are expected to complete their lab assignments in the Open Lab facilities at the Department of Geographical Sciences of the University of Maryland during assigned lab hours. All lab assignments are to be submitted via **Canvas** by specific due date and time.

Students are expected to treat each other with respect. Disruptive behavior of any kind will not be tolerated. Students who are unable to demonstrate civility with another, or the instructor will be subject to referral to the Office of Student Conduct or to the University Campus Police. You are expected to adhere to the Code of Student Conduct.

In this class, students will be allowed and encouraged to use their personal computers or other means of technology to take class notes and complete practice exercises.

Academic integrity

The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit <http://www.shc.umd.edu>.

Honor pledge must be included in every assignment and exam submitted by the students:

"I pledge on my honor that I have not given or received any unauthorized assistance on this assignment/paper/examination."

Students with disabilities

Every effort will be made to accommodate students who are registered with the Disability Support Service (DSS) Office and who provide the instructor with a University of Maryland DSS Accommodation form which has been updated for the Fall 2008 semester. This form must be presented to the instructor no later than March 1st, 2016. The instructor will not be able to accommodate students who are not registered with DSS or who provide the instructor with documentation which has not been reviewed and approved by UM's DSS Office.

Medical excuses

Campus Senate policy requires students who are absent due to illness/injury to furnish documentary support to the instructor. Students must contact the instructor by email or by phone prior to class time in which the student will indicate he/she has an illness/injury. In accordance with the University of Maryland policy on student medical absences, “the University will accept as an excused absence a self-signed note from a student who has missed a single lecture, recitation, or laboratory, attesting to the date of the illness. The note must also contain an acknowledgement by the student that the information is true and correct and that providing false information is prohibited under Code of Student Conduct.

The student is also obligated to make a reasonable attempt to inform the instructor of his/her illness in advance.”

(<http://www.provost.umd.edu/announcements/StudentMedicalAbsences.cfm>). In this course, only one self-signed note will be accepted for a single lab absence. If additional labs or any of the exams and in-class assessments (i.e. Major Grading Events) are missed, a written documentation from a health care provider is required. The student must present written documentation verifying his/her illness/injury on the first day of class that he/she returns to class. The student will not be allowed to turn in missed assignments or make up exams if he/she has not provided this documentation. In addition, if it is found that the student has falsified the documentation provided, he/she will be referred to the University’s Student Conduct Office.

Religious observance

By February 15, 2015, students must provide the instructor, in writing, a request for a makeup exam for a specific exam date on this syllabus that students are unable to make due to a specific religious observance (specify) on a specific date. Please refer to the Online Catalog Policy on Religious Observance. Please remember that accommodations are NOT made for travel to and from the religious observance.