

GEOG 376: Introduction to Programming for Geographers

Spring 2018

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or by appointment (please email)

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Schedule of Classes

Lecture: M 12:00pm - 12:50pm LEF 1158

Syntax Session: W 12:00pm - 12:50pm LEF 1158

Lab 0101: F 9:00am - 11:00am LEF 1138

Lab 0102: F 9:00am - 11:00am LEF 1136

General information about the course

This course introduces conceptual and practical aspects of programming for geographic applications. The main focus of this course is on developing a solid understanding of basic programming techniques irrespective of the specific programming language including variables, looping, conditional statements, nesting, math, strings, and other concepts. Students in this course will develop a proficiency in applying these basic programming principles to manipulating spatial data sources within the Geographic Information Systems (GIS) environment. In addition, students will be briefly introduced to the ArcPy component of ESRI's ArcGIS software and learn how to work with open source geospatial toolkits.

The prerequisites for this course include GEOG 373 or another introductory course for Geographic Information Systems (GIS). Students taking the course must be familiar with geographic data structures, basic GIS concepts, and demonstrate basic understanding of geospatial analysis. No prior programming experience is required or expected.

Learning outcomes for the course

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

- Design a solution for a geographic program using pseudocode and available spatial analysis functions.

- Automate geospatial data processing using Python programming language
- Appropriately use common programming techniques and structures including variables, flow control, looping, Boolean expressions.
- Implement automated grid-based analysis functions.
- Automate manipulation of spatial and non-spatial data and text manipulation using the Python programming language.
- Develop automated data processing flows and map generation based on user input.

Course materials

Required textbook: No textbook is required for this class

Optional textbooks:

- Lutz, Mark. (2013) Learning to Python, 5th Edition
- Romalho, Luciano (2015) Fluent Python: Clear, Consise, and Effective Programming

Additional web-based sources:

- Online Python documentation: python.org – please make sure to look up documentation relevant to the 2.7.x version of Python
- ArcGIS10.4 online help files: <http://resources.arcgis.com/en/help/>

Course communication

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

Class structure

Each week, the class structure includes one 50-min lecture period, one 50-min syntax session, and one 2-hour lab period per week.

Lecture component

The lecture sessions will introduce concepts and code that play a fundamental role in learning to program. Attendance for lectures is mandatory and attendance will be recorded randomly 3 times during the semester. This will contribute to your participation/attendance grade (1%). Keep in mind that this 1% could mean the difference between an A- or a B+.

Syntax Session

While new concepts will be introduced in the lecture component (Monday), the Syntax Sessions (Wednesday) will involve hands-on problem solving, demonstrations, writing code in-class, and some group discussion. A weekly problem set will be posted to ELMS on Monday, and the syntax sessions will involve going over example problems that will be useful for the assignments and your future career. Attendance is highly encouraged but not mandatory for those who can solve problems without attending. Bringing a laptop is not necessary, but would be useful.

Lab component

The course includes a lab component, which is of equal importance to, if not more than, the lecture and syntax session. During the lab exercises the students will work individually to practice skills developed in the class within the python scripting environment. All deliverables, as described in each lab assignment, should be submitted online via <https://myelms.umd.edu> before posted deadlines. **Late assignments will be given a 10% penalty per day up to a maximum of 5 days (including weekends). Assignment submitted more than 5 days late will be given a grade of 0.** Labs will contribute 54% to the total grade for the course. There will be a total of 6 lab exercises. Each lab is worth 9% of the total 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 GEOG376.

Provisional outline of topics covered in the course and exams

Please, note that modifications may be introduced to the schedule as the semester progresses. Updated schedules will be made available to all students via **ELMS** as soon as possible.

Wk	Lecture	Syntax	Topic	Lab
1	01-24	NA	Course overview, Introduction to programming and programming tools	No Lab
2	01-29	01-31	Data types, Variables, and Operators	Lab 1: Variables and String Manipulation
3	02-05	02-07	Strings	
4	02-12	02-14	Lists & Dictionaries	Lab 2: Loops & Lists
5	02-19	02-21	Loops	

6	02-26	02-28	Conditionals and Flow Control	Lab 3: Conditionals & Functions
7	03-05	03-07	Functions & Modules	
8	03-12	03-14	Midterm Review & Exam	<i>No Lab</i>
9	03-19	03-21	Spring Break	
10	03-26	03-28	Files: Input and Output	Lab 4: File Inputs & File Outputs
11	04-02	04-04	Classes	
12	04-09	04-11	GDAL & OGR	Lab 5: Open Source Geospatial Libraries
13	04-16	04-18	ArcPy Data Structures	
14	04-23	04-25	ArcPy Queries	Lab 6: ESRI's ArcPy
15	04-30	05-01	ArcPy Custom Tool	
16	05-07	05-09	Error Handling and <i>Final Review</i>	<i>No Lab</i>
	TBA		Final Exam	

Mid-term and final exams

The course includes 2 exams: 1 mid-term exam (worth 20% of the total grade) and 1 final exam (25% of the total grade). Although the exams are non-cumulative, understanding of the principles acquired in earlier parts of the course will be necessary to answer exam questions in the later parts of the course. All exams will be “closed book” and will test student’s understanding of programming concepts, data structures and ability to solve specific geographic problems. Exams will be written (no computer) and take place in class (lecture room).

Exam make up policy

Make-up exams are only available to students under extenuating circumstances (e.g., medical reason). Students unable to take the test for a valid reason should notify the instructor at least 3 weeks 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. Students must complete both exams in order to pass the course.

Grade determination

Assignments: 54% (6 x 9%)

Midterm: 20%

Final Exam: 25%

Participation/Attendance: 1%

Letter Grade	Lower Bound	Upper Bound
A+	97.1	100
A	93.1	97
A-	90.1	93
B+	87.1	90
B	83.1	87
B-	80.1	83
C+	77.1	80
C	73.1	77
C-	70.1	73
D+	67.1	70
D	63.1	67
D-	60.1	63
F	0	60

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 Geography of the University of Maryland. All lab assignments are to be submitted via **ELMS** 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 one another, the teaching assistants, 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 Spring 2018 semester. This form must be presented to the instructor no later than March 1st, 2018. 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 UMD'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 9, 2018, students must provide the instructor, in writing via email, 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.