PROGRAMMING FOR GEOGRAPHIC INFORMATION SYSTEMS

GISC 2435 (SYNONYM 46727)

Mondays and Wednesdays from 7:50 - 10:30 PM in Room 3207, Building 3000, Northridge Campus

CONTACT INFORMATION

Instructor: Megan Yancy

Office: Adjunct Faculty Room, Building 3000, 2nd Floor (in hallway leading to **Room 3212)**, Northridge Campus

E-mail: megan.yancy@g.austincc.edu

Office Hours: **Monday/Wednesday**, 7:10 – 7:40 pm before class.

COURSE DESCRIPTION

GISC 2435, Programming for GIS, focuses on the use of programming languages to customize and expand the capability of GIS applications. Instruction will include object-oriented and component programming. The Python language is used to teach general programming principles and how to apply them to specific GIS functions. No prior programing experience is required. This class counts towards the GIS II certificate.

Prerequisites: GISC 2435 is one of the courses offered for students pursuing the GIS II certificate. Enrolled students are expected to have successfully completed the prerequisite classes, **GEOG 2470** (Introduction to GIS) and **GEOG 2471 or GISC 2420** (Intermediate GIS), **OR** to have comparable academic or professional experience. No previous programming experience is expected or required. For students planning to take **GISC 2250** (Scripting for GIS), a class that focuses on ArcGIS ModelBuilder, it is recommended but not required to take GISC 2250 prior to taking GISC 2435.

TEXTS/MATERIALS

Suggested: *Python Scripting for ArcGIS* by Paul A. Zandbergen. ESRI Press, 2013. ISBN 978-1-58948-282-1

This covers most topics covered by class, but you will be able to complete class without this book.

Required: *Think Python: How to think like a Computer Scientist* by Allen B. Downey. Available for free download at http://www.greenteapress.com/thinkpython/ . *Think Python* is a Free Book. It is available under the Creative Commons Attribution-NonCommercial 3.0 Unported License.

Recommended: 1 GB (or greater) portable USB flash drive. A larger drive is even better. This will allow you to work in the lab and at home. Regular backups of class materials and projects are strongly recommended.

INSTRUCTIONAL METHODOLOGY

The course is taught with a combination of lectures, reading assignments, class exercises, and assigned projects. We make extensive use of Blackboard throughout the semester. Student comprehension will be gauged through reading assessments (written responses and class discussion). Class exercises will teach

methods and principles using step-by-step directions and lots of hands-on practice. Projects will give students the opportunity to apply skills learned to meet clearly stated goals and outcomes. Students will review each other's work in ways that replicate workplace environments. Each student will give a verbal presentation and write a brief report as part of the final project.

COURSE RATIONALE

Programming for Geographic Information Systems (GIS) is designed to provide the students with an understanding of the methods and theories of programming for GIS that will allow students to apply GIS knowledge and skills to everyday life and their chosen careers, and to apply the course towards a certificate or an associate's degree at Austin Community College. The course focus is on GIS task automation using Geoprocessing tools and the Python language. Students are introduced to the fundamentals of programming through an introduction to Python in the context of geographic information systems.

COMMON OBJECTIVES

By the end of this course, the student will be able to:

- Use and deploy Python programs and script tools in ArcGIS Desktop 10.3
- Understand and use an Integrated Development Environment for program composition and testing
- Compose basic to complex Python programs that automate common tasks performed in GIS work environments
- Schedule tasks to run automatically (in a standard Windows environment)
- Identify types of problems where programming is appropriate
- Provide appropriate program documentation
- Share Python programs and script tools with other GIS users
- Know where to find and how to use resources for Python specifically and programming

Course Evaluation/Grading System

Grading Policy

Attendance (**5% of grade**)

Regular student attendance for GISC 2435 is expected and will count towards the final grade. Attendance is required for both the lecture and the lab portion of each class. One excused absence is permitted per semester. 2 points will be awarded for full attendance per class meeting. A point will be deducted for late arrivals and/or early departures.

Lab exercises (**20% of grade**)

In-class structured exercises will be used to develop applied skills in an interactive environment. Most exercises will be graded on a 3 point system: 0 for no submission, 1 for partial submission, 2 for complete with errors, and 3 for complete and correct. Exercises are due by midnight Saturday on the week assigned. No late exercises are accepted.

Reading Assessment: (**10% of grade**)

Students are expected to complete reading assignments before each Monday that we meet (by 7:45 PM). Each weekly assignment will include questions related to the reading. The questions are intended as a study aid to prepare for in class discussions during lecture. Reading assessments will be graded on a 2 point system: 0 for no submission, 1 for partial submission, and 2 for complete submission.

Code Reviews and Challenge: (**10% of Grade**)

Students are expected to complete several code reviews to demonstrate debugging and and process improvement. Code reviews will be related to the topics covered for a particular week. Students will pair up and do the review, followed by a class discussion about each code review, and students are expected to give suggestions on process improvement.

Code Challenges are intended to be a chance to showcase learned skills by working to quickly solve a problem as part of a team. This will be done with Pair Programming, and is a "mini-project" to be completed within one class period.

PROJECTS (50% OF GRADE)

Students will be assigned projects of varied complexity to promote the development of problem-solving skills and the application of concepts and practices learned from assigned reading, exercises and lectures. There will be 5 projects, each worth 10% of your final grade. Due dates and requirements will be spelled out for each project. Students will give 'lightning talk' presentations on selected projects throughout the semester. Each student will give a formal presentation of their final project during the final class meeting.

A	90-100%
B	80-89.9%
C	70-79.9%
D	60-69.9%
F	< 59.9%

Note: The grade of "I" (Incomplete) is very rarely assigned. In the event that a true emergency (such as hospitalization) that occurs after the withdrawal date prevents the student from completing the course, a grade of "I" may possibly be given at the discretion of the instructor. Incompletes must be made up by the deadline published in ACC's academic calendar (1 August 2016) or the "I" will automatically be converted to an "F".

Attendance Policy

Success in this class depends on your commitment. Class and lab attendance is your choice and my expectation. If you have travel plans made prior to or during the fall semester, if your car breaks down, if you have a minor family or work emergency, or if any other unexpected or expected event prevents your attendance, it is up to you to plan accordingly. **You are responsible for any announcements, lectures, or assignments given in class and lab even if you were not in class that day**. Students who miss class/lab need to hand in assignments **on time** and need to make **their own** arrangements to obtain related notes, handouts, or announcements. Late assignments may possibly be accepted at the instructor's discretion only in the case of a **well-documented** emergency. However, no guarantee is made that late assignments will be eligible for maximum points. If you find that you have too many outside commitments to complete assignments or attend class, you may want to consider withdrawal.

Your full participation in class is expected. Cell phones and other mobile devices are to be silenced or turned off during lecture. No cell phone conversations are permitted in the classroom. Online activities that are not directly related to class activities are highly discouraged. The instructor reserves the right to request a student to leave the room when the use of the lab computers or mobile devices for non-class related activities causes distraction.

Students with Disabilities

Each ACC campus offers support services for students with documented disabilities. Students with disabilities who need classroom, academic or other accommodations must request them through the office of Student Accessibility Services (SAS). Students are encouraged to request accommodations when they register for courses or at least three weeks before the start of the semester, otherwise the provision of accommodations may be delayed.

Students who have received approval for accommodations from SAS for this course must provide the instructor with the Notice of Approved Accommodations from SAS before accommodations will be provided. Arrangements for academic accommodations can only be made after the instructor receives the Notice of Approved Accommodations from the student.

Students with approved accommodations are encouraged to submit the Notice of Approved Accommodations to the instructor at the beginning of the semester because a reasonable amount of time may be needed to prepare and arrange for the accommodations.

COMMUNICATIONS

EMAIL AND BLACKBOARD

Every ACC student is given an email account through ACC. This is the email address that I will use and the college will use to contact you throughout the semester. As a requirement of this course, you MUST activate your ACC email account and check it as least every 3-4 days. To learn more about this email and how to activate it, go to http://www.austincc.edu/accmail/. Activate it today and start checking it regularly.

My expectation is that you will use Blackboard and the designated upload area to post completed assignments, labs and projects. If you are not familiar with Blackboard, or if you have questions, please consult the student support page at http://irt.austincc.edu/blackboard/stfaq.php . For those of you who have taken classes previously at ACC, be aware that the new version of Blackboard does not have the Digital Drop Box.

As a programmer, you will often find yourself as part of a team. There is a forum for students to ask questions of each other, share tips and tricks, and discuss techniques on the Blackboard site.

*Assignments are due **at the time specified in the assignment.** You will receive partial credit for a partial assignment received on time, and no credit for any assignment received late. The instructor will specify those cases when assignments (complete and partial) may be resubmitted and what additional points can be earned.*

 If an assignment is dropped from the class schedule, points will be awarded automatically.

COMMUNICATING WITH THE INSTRUCTOR

The best way to contact me outside of my official office hours is by email. I will check my ACC email account every week day **evening** and on weekends, but be aware that I generally am not able to log in to my account until after work on weekdays. I cannot guarantee that I will read or respond to email prior to evenings, even on weekends. Please plan your communications with me accordingly.

ACADEMIC INTEGRITY

Students enrolled in this class are responsible for observing the policy on academic integrity described in the online publication, *Student Standards of Conduct and Disciplinary Process*, which can be found at http://www.austincc.edu/admrule/1.04.006.htm. Acts prohibited by the college for which discipline may be administered include scholastic dishonesty, including but not limited to cheating on an exam or quiz, plagiarizing, and unauthorized collaboration with another in preparing outside work. Academic work submitted by students shall be the result of their thought, research, or self-expression. Academic work is defined as, but not limited to tests, quizzes, whether taken electronically or on paper; projects, either individual or group; classroom presentations, and homework.

If a student commits any of the above actions, the instructor may seek disciplinary action in the form of an academic penalty (which may include a course grade of 'F'). Such disciplinary action will be at the discretion of the instructor.

ACADEMIC FREEDOM

Each student is strongly encouraged to participate in class discussions. In any classroom situation that includes discussion and critical thinking, there are bound to be many differing viewpoints. Students may not only disagree with each other at times, but the students and instructor may also find that they have disparate views on sensitive and volatile topics. It is my hope that these differences will enhance class discussion and create an atmosphere where students and instructor alike will be encouraged to think and learn. Therefore, be assured that your grades will not be adversely affected by any beliefs or ideas expressed in class or in assignments. Rather, we will all respect the views of others when expressed in classroom discussions.

LAST DAY TO WITHDRAW

The last day to withdraw from this course for the Spring 2016 session is **Monday, April 25, 2016.** It is the student's responsibility to withdraw from the course if needed. If you have attended at least one class, the instructor will **NOT** withdraw you from the class. The instructor will only withdraw those students who have never attended class.

A FEW IMPORTANT THINGS TO REMEMBER:

- Neither I nor other instructors give you grades. You earn grades. Use this syllabus as your reference to achieve the grade that you desire and are willing and able to work towards.

- Your grade in this class will reflect **your** judgment about what is most important to you, and your time management skills your time. If you struggle to keep up, you may have overcommitted yourself. Strive to maintain a realistic balance among your academic, employment and personal commitments.

- A successful GIS professional is a lifetime learner. Become a seeker of knowledge. Learn how to teach yourself what you need to know.

- GIS programming is rewarding and fun! Don't stress too much and enjoy the learning process.

COURSE OUTLINE/CALENDAR

The instructor reserves the right to change the lecture, lab and assignment schedule if necessary.

Dates	Topic	Assigned reading	Project Due Dates
1/20	First Class: Introduction to Python and Python Fundamentals: Numbers, boolean, strings, and variables	Think Python (Selections) Python Documentation	

		(Selections)	
1/25, 1/27	Python Fundamentals: Review: Numbers, Strings, Boolean and Variables Continuing: Lists, Loops, Commenting and Documentation, Introduction to program workflows, First Program	Think Python (Selections) Python Documentation (Selections)	
2/1, 2/3	Dictionaries and Functions, Geoprocessing Review: Toolboxes, ModelBuilder, Simple Scripting, and data management	Think Python (Selections) Python Documentation (Selections) ArcGIS Documentation	Code Review 1 on 2/3 First Project due 2/10
2/8, 2/10	Python in ArcGIS: The Window	ArcGIS Documentation	
2/15, 2/17	Geoprocessing with Python and creating Custom Tools	ArcPy Documentation	
2/22, 2/26	Geoprocessing with Python and creating Custom Tools	ArcPy Documentation	Code Review 2 on 2/26 Project 2 due 3/1
3/1, 3/3	Exploring Spatial Data: existence, properties, listing, and looping	ArcPy Documentation Think Python (Selections)	
3/8, 3/10	Programming Techniques: Debugging and error handling, Pair Programming, Agile Software Development, Other Q&A	Class Discussion	Code Challenge 3/10
3/15, 3/17	Spring Break - no classes		
3/22, 3/24	Manipulating spatial data: cursors, SQL, data access	ArcPy Documentation, Reading packet	Code Review 3 on 3/24

			Project 3 due on 3/29
3/29, 3/31	Working with geometries: geometry objects, spatial references and cursors	ArcPy Documentation, Reading packet	Final project selection made and written up by 4/5
4/5, 4/7	Working with rasters: properties, Spatial Analyst, NumPy & map algebra	ArcPy Documentation, Reading packet	
4/12, 4/14	Map scripting	ArcPy Documentation, Reading packet	
4/19, 4/23	Python functions and classes	Think Python Python Documentation	Project 4 due by 4/26
4/26, 4/28	Sharing tools	ArcPy Documentation, Reading packet	Project 5 (student choice – report and presentation on 5/12)
5/3, 5/5	Project 5 Work Week		
5/12, 5/14	Specialized tasks	Reading packet	
5/10, 5/12			Project 5 due on 5/10 Project 5 report and presentation on 5/12