GISC 419/GEOS 576: GIS Programming (Spring 2020)

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Room: EST 356 GIS Computer Lab
Time: TR 11:10 pm – 12:30 pm
Office Hour: TR 1:00pm – 2:00pm or by appointment
Prerequisite: GISC 317 or special permission

Course website: https://blackboard.wku.com/

Texts:

- **Paul A. Zandbergen**. 2014. **Python Scripting for ArcGIS**. ESRI Press. ISBN: 9781589483712 (**Required**)
- **ESRI ArcGIS Resource Center – Geoprocessing**: http://desktop.arcgis.com/en/arcmap/latest/analyze/main/
- **Python Tutorial 1:** https://www.programiz.com/python-programming
- **Python Course on YouTube:** https://www.youtube.com/playlist?list=PLlrxD0HtieHhS8VzuMCfQD4uJ9yne1mE6
- **Python Tutorial 2**: http://docs.python.org/tutorial/
- **Python 2.x Official Documentations**: https://docs.python.org/2/

Optional Texts

- **Beginner's Guide to Python**: http://wiki.python.org/moin/BeginnersGuide
- *Geographic Information Systems and Science*, 2nd Edition, by Longley et al.

Required Equipment and Materials

- A portal hard drive/flash drive to back up your course files, data, exercises, and projects.

Course Description:

GIS can be applied into many real-world fields, such as environmental management, market research, urban planning, transportation management, water resource management, utility planning and management, etc. Different application domains may have different requirements and needs for GIS. However, most commercial GIS software are targeted to general applications and very few deliver exactly what users require '***out of the box***'. Thus, it is very essential to learn the process of expending the capability of any GIS system. In this course, you will learn that ArcGIS is considerably more than a desktop computer program, and that to access the additional flexibility available, you need to become an **advanced** user conversant with a range of technologies and methods, including customization and computer programming. In this course, topics related to custom geoprocessing will be covered, particularly **ArcGIS ModelBuilder** and **Python scripting** in ArcGIS desktop.

Course Objectives:

1) Get familiar with the basic concepts related to GIS customization.
2) Understand some advanced geoprocessing issues and develop advanced skills in geoprocessing within ArcGIS desktop.
3) Develop competency in custom geoprocessing with ArcGIS **ModelBuilder**.
4) Develop competency in basic object-oriented (OO) **programming** skills with Python.
5) Develop competency in custom geoprocessing with **Python scripting**.

Class Format and Policies:

The course delivery will be the combination of *class meetings* and *web guided self-studies* using Blackboard. Students must attend classes weekly and visit **http://blackboard.wku.com** regularly for class materials, quizzes, exams, and electronic submission of their assignments and projects. The class website contains lecture notes, assignments, quizzes, exams, other materials related to the course, student grades as a way to monitor progress in the class, and other pertinent information. The class includes both lecture and lab components. Lecture focuses on the conceptual basis of GIS customization, geoprocessing and computer programming. The labs provide students with hands-on opportunities to practice skills and techniques in ArcGIS ModelBuilder and Python scripting. Keep in mind that all project assignments and exercises may require time of little interruption to complete.

Grading:

The evaluation of your performance in this course will be derived from: (i) three exams covering aspects of GIS customization, geoprocessing and computer programming; (ii) six lab projects; (iii) the completion of all required lab exercises, homework, and quizzes. The course is organized in three course modules. Students must complete the required lab exercises and projects and pass the exam in each module in timely fashion so that to move on the next module.

You will earn points toward your final grade according to the following schedule:

Item	%
Project #1 (Module 1)	10
Project #2 (Module 1)	7.5
Project #3 (Module 2)	7.5
Project #4 (Module 2)	10
Project #5 (Module 3)	10
Project #6 (Module 3)	10
Quizzes (15 in Total)	10
Lab exercises/homework/class participation	5
Exams (one for each module, 10 points each)	30

Grading will follow the below scale:

Average Score	Grade
90 – 100	A
80 – 89.9	B
70 – 79.9	C
60 – 69.9	D
< 60	F

Attendance:
Class attendance is required during class meetings. Remember that this is a programming course. To advance, you will need to rely on topics covered in previous classes and assignments. Roll will be taken at the start of every class period. If a student enters class late it is his or her responsibility to see me at the end of the class period and make sure that I have marked them as present. Student who has absence record will have a 2-point deduction for each day that he/she misses. The exception can be made only if legitimate written document is presented and the instructor is notified beforehand. The student is responsible for all lecture notes, materials, etc.

Quizzes and Exam:
There are 5 quizzes in each course module and a total of 15 quizzes in the whole course. All quizzes and three exams, each for a course module, cover the main concepts and topics in GIS customization, geoprocessing, and computer programming. The quizzes are open-book while the exams are closed-book. Both will be made available according to our class schedule. You will take quizzes in your own time when they become available, but you will take exams together in class (TBD).

GIS Lab Policies:
The GIS lab is available for use any time during the day when a class is not scheduled (schedule posted on lab door). Evening hours will be made available and announced as soon as the lab monitor schedule is finalized. The lab is only to be used, however, only for work related to GIS and remote sensing classes. Work such as term papers for other classes should be done in one of the universities general computer labs (for locations, see http://stech.wku.edu/lablocations.html). Food, drink and tobacco products are strictly prohibited from the lab to protect the university's investment in computer equipment and keep the facility looking nice. The lab is monitored with cameras to enhance security.

Course Withdrawal:
Students who find it necessary to withdraw completely from the university (WKU) or from this course should report to the Office of Registrar in Potter Hall to initiate **W**ithdrawal procedures before the last **W**ithdrawal date. Students who cease attending class without and official **W**ithdrawal will receive a **F**ailing grade.

Students with Disabilities:
In compliance with University policy, students with disabilities who require academic and/or auxiliary accommodations for this course must contact the Student Accessibility Resource Center located in Downing Student Union, room 1074 of the Student Success Center. The phone number is 270.745.5004. or email at sarc.connect@wku.edu. Please do not request accommodations directly from the professor or instructor without a letter of accommodation from The Student Accessibility Resource Center.

Other Policies:
The Department of Geography and Geology strictly adheres to university policies, procedures, and deadlines regarding student schedule changes. It is the sole responsibility of the student to meet all deadlines with regard to adding, dropping, or changing the status of a course. Only in exceptional cases will a deadline be waived. The Student Schedule Exception Form is used to initiate all waivers. This form requires a written description of the extenuating circumstances involved and the attachment of appropriate documentation. Poor academic performance, general malaise, or undocumented general stress factors are not considered as legitimate circumstance.

Western Kentucky University (WKU) is committed to supporting faculty, staff and students by upholding WKU's Title IX Sexual Misconduct/Assault Policy (#0.2070) at https://wku.edu/eoo/documents/titleix/wkutitleixpolicyandgrievanceprocedure.pdf and Discrimination and Harassment Policy (#0.2040) at https://wku.edu/policies/hr_policies/2040_discrimination_harassment_policy.pdf.

Under these policies, discrimination, harassment and/or sexual misconduct based on sex/gender are prohibited. If you experience an incident of sex/gender-based discrimination, harassment and/or sexual misconduct, you are encouraged to report it to the Title IX Coordinator, Andrea Anderson, 270-745-5398 or Title IX Investigators, Michael Crowe, 270-745-5429 or Joshua Hayes, 270-745-5121.

*Please note that while you may report an incident of sex/gender based discrimination, harassment and/or sexual misconduct to a faculty member, WKU faculty are "Responsible Employees" of the University and **MUST** report what you share to WKU's Title IX Coordinator or Title IX Investigator. If you would like to speak with someone who may be able to afford you confidentiality, you may contact WKU's Counseling and Testing Center at 270-745-3159*.

Tentative Course Outline: Subject to revision as conditions warrant.

Module	Week	Topics, Projects, and Exams
1	1	• Syllabus & Course Organization • Introduction to GIS Customization • Spatial Analysis Process and Geoprocessing
	2	• Why Custom Geoprocessing?
	3	• Custom Geoprocessing with ModelBuilder
	4	• Custom Geoprocessing with ModelBuilder • **Project #1 Submitted**
	5	• Custom Geoprocessing with ModelBuilder • **Project #2 Submitted** • **Exam 1**
2	6	• Introduction to Python Scripting • Python Basics – Variables Data Types
	7	**Spring Break. No Classes**
	8	• Python Basics – Variables Data Types • Python Basics – Operators and Types of Statement
	9	• Python Basics – Control Program Flow • **Project #3 Submitted**
	10	• Object-Oriented Concepts and Principles • Python Basics – Definition and Module • **Project #4 Submitted** • **Exam 2**
3	11	• Custom Geoprocessing with Python – Scripting Workflows
	12	• Custom Geoprocessing with Python – Access Attribute Data
	13	• Custom Geoprocessing with Python – Access Geometry • **Project #5 Submitted**
	14	• Custom Geoprocessing with Python – Mapping Part I
	15	• Custom Geoprocessing with Python – Mapping Part II • **Exam 3**
	16	• **Exam Week**: **Project #6 Submitted**