GISC 419/GEOS 576: Custom Geoprocessing and GIS Programming (Spring 2019)

Instructor: Dr. Jun Yan
Office: EST 333
E-mail: jun.yan@wku.edu
Office Tel.: (270)745-8952

Room: EST 356 GIS Computer Lab
Time: TR 12:45 pm – 2:05 pm
Office Hour: TR 2:10pm – 3:30pm or by appointment
Prerequisite: GISC 317 or special permission

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

Texts:

1. **Paul A. Zandbergen**. 2014. **Python Scripting for ArcGIS**. ESRI Press. ISBN: 9781589483712 (**Required**)
2. **ESRI ArcGIS Resource Center – Geoprocessing**: http://desktop.arcgis.com/en/arcmap/latest/analyze/main/what-is-geoprocessing.htm
3. Python Official Documentations: http://www.python.org/
    a. **Python Tutorial**: http://docs.python.org/tutorial/
    b. Beginner's Guide to Python: http://wiki.python.org/moin/BeginnersGuide
4. David Allen. 2011. *Getting to Know ArcGIS ModelBuilder*. ESRI Press. ISBN: 9781589482555 (optional)
5. *Geographic Information Systems and Science*, by Longley et al. (optional)

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 ModelBuilder and Python scripting in ArcGIS desktop.

Course Objectives:
1. Get familiar with the basic concepts related to GIS customization;
2. Master advanced geoprocessing skills in ArcGIS desktop, partially with **ModelBuilder**;
3. Develop competency with basic object-oriented (OO) **programming** skills for custom geoprocessing with **Python**.

Class Format and Policies:

The course format will be the combination of *class meetings* and *web guided self studies* using WKU E-courses and ESRI online courses. Students are expected to use **http://ecourses.wku.edu** regularly for available class materials and electronic submission of their exercises, assignments and projects. This class website contains lecture notes, assignments, other materials related to the course, student grades as a way to monitor progress in the class, and other pertinent information. The class meetings include the lecture and lab components. Lecture focuses on the conceptual basis of GIS customization, geoprocessing and computer programming. The labs provide students with opportunities to get familiar with ArcGIS ModelBuilder and Python scripting. Note that all project assignments and exercises will require time outside of class to complete. Auditing of this course is not allowed.

Grading:

The evaluation of your performance in this course will be derived from (i) an exam covering aspects of GIS customization, geoprocessing and computer programming; (ii) six lab projects; (iii) the completion of all required lab exercises and homework. Students must complete the required lab exercises and projects in timely fashion. Any late submission, without the extension granted by the professor, will have an automatic 10-point deduction.

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

Item	%
Project #1	10
Project #2	10
Project #3	10
Project #4	15
Project #5	15
Project #6	15
Lab exercises/home works	5
Exam	20

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 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.

Exam:
The only exam covers the main topics in GIS customization, geoprocessing and computer programming. Make-up exam will be given only for the following special circumstances: (1) a university-sponsored event, and (2) illness with a doctor's written excuse. Justifying documentation has to be presented to (and accepted by) the instructor **BEFORE** the date of the exam.

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.

Week	Topics
1	• Syllabus & Course Organization • Introduction to GIS Customization • Spatial Analysis Process and Geoprocessing • Introduction to Custom Geoprocessing
2	• Custom Geoprocessing with ModelBuilder
3	• Custom Geoprocessing with ModelBuilder
	• **Project #1 Assigned**
4	• Custom Geoprocessing with ModelBuilder
5	• Custom Geoprocessing with ModelBuilder • **Project #2 Assigned**
6	• Custom Geoprocessing with ModelBuilder
7	• Introduction to Python Scripting • Python Basics – Variables Data Types • **Project #3 Assigned**
8	• **Spring Breaks, No Classes**
9	• Python Basics – Variables Data Types • Python Basics – Types of Statement • Python Basics – Control Program Flow
10	• Python Basics – Functions and Modules • Object-Oriented Concepts • **Project #4 Assigned**
11	• Custom Geoprocessing with Python
12	• Custom Geoprocessing with Python • **Project #5 Assigned** • **Review for the Exam**
13	• Custom Geoprocessing with Python • **Project #6 Assigned**
14	• Custom Geoprocessing with Python • **Exam**
15	• Custom Geoprocessing with Python
16	• **Exam week: Programming Project #6 Due**