Western Kentucky University

GIS Analysis and Modeling

GISC 417 On Demand (3CH)

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Office Hours: by appointment
Materials: A flash drive and WKU's MyStuff (for data retrieval, storage, and backups).
Computer: Students may utilize campus computer labs for access to software it is recommended to download the software onto your own system. ESRI products do not work on a mac or chrome books. You will need to check your systems capabilities.
Textbooks: ***GIS Research Methods: Incorporating Spatial Perspectives*** by S. Steinberg and S. Steinberg and ***Geographic Information Systems and Science*** by P. Longley, et. al.
Prerequisite: GISC (or GEOG) 317 GIS, equivalent, or special permission by instructor.

COURSE DESCRIPTION:

This course develops expertise with a broad range of spatial analysis and modeling functions using geographic information systems. A problem-oriented approach stresses the utility of GIS analysis to a variety of fields such as agriculture, business, climate, geology, natural resource management, weather, urban planning, etc. Students will become acquainted with both raster and vector analysis techniques using ArcGIS for Desktop (ArcInfo (Advanced) license), ArcGIS Pro, QGIS, and other related software such as GPS collecting applications. This course will highly depend upon skills obtained in GISC (or GEOG) 316 and 317, or equivalent and prior GIS experience. This course is designed for students that are serious about learning and furthering their knowledge and skills in GIS, particularly in GIS workflows. This course is a project-based course and will require time outside in the field.

LEARNING OUTCOMES:

The objectives and learning outcomes in this course are:

1. to develop geographic information system (GIS) modeling concepts and a working knowledge of GIS modeling methods of various features, both discrete and continuous, for geospatial data in a GIS;
2. to develop competence designing and carrying out geospatial data analyses (or GIS workflows) in a GIS environment; and
3. to develop and demonstrate skills communicating results of GIS modeling and GIS analysis of geospatial data in a wide array of applications.

CLASS DELIVERY (BLACKBOARD):

Class content will be delivered via Blackboard (http://www.wku.edu and select 'Blackboard' located in lower left in the 'More Links' panel). Content will contain both reading assignments and a lab component. Reading assignments will focus on the conceptual basis of GIS analysis, introducing concepts and principles needed for effective GIS use. Students should take notes during the reading assignments. The lab component provides students with practice applying software applications to a variety of real-world

problems making connections between modeling and analysis as well as understanding workflows. If you do not have access to an up-to-date android or iOS device, then you are required to purchase an inexpensive handheld GPS unit. A general schedule is available, please use this as a primary guide.

COURSE CONTENT:

This course will assume and apply knowledge and skills obtained from prerequisites as well as expanding on those areas for issues in analysis and modeling preparing students for real-world GIS and to effectively carry out both research and real-world projects. After completing this course, a student is expected to do the following listed:

- Understand the implementations of real-world GIS.
- Construct a digital model to represent features, both discrete and continuous. Methods of generalization will be used to decide level of detail on what to represent over a given time period.
- Understand a wide range of GIS principles for working with geographic data (i.e., spatial is special).
- Know what GIS modeling means, and be able apply the different types of GIS models for various GIS applications as well as understanding the different needs of GIS software for GIS models.
- Demonstrate an understanding of uncertainty and its sources in geographic information and how they affect GIS representations for analysis and modeling.
- Understand and apply the role of a data model in GIS and the different levels of data model extraction from reality: Conceptual Model, Logical Model, and Physical Model.
- Explain in detail the strengths and weaknesses of various GIS data models and the technical issues involved with creating a representation in GIS for analysis.
- Understand and explain the differences in consumer, mapping and surveying grade GPS units.
- Demonstrate an understanding of GPS while taking into consideration for use of consumer, mapping, survey mapping grade GPS in GIS modeling and analysis.
- Plan and execute a GIS data collection method and be able to manage that method by capturing and transferring GPS data with multiple users and/or platforms.
- Create and maintain a GIS database with multi-users and/or platforms for projects and decision-making activities.
- Apply a variety of techniques for geovisualization including 2.5D (or 3D) models.
- Utilize various surface techniques and implement various designs for geographic analysis.
- Know how to implement and manage a GIS for an organization and how organizational GIS can fail.
- Know and understand the different roles of professional GIS staff, and the importance of GIS professional development and GIS education.
- Understand existing GIS and GPS legal/liability issues and court cases in the United States and with the international community.
- Familiarization of best practices and workflows in GIS.

EXPECTATIONS of STUDENTS:

Since this course highly depends upon ArcGIS Desktop skills and knowledge obtained in GISC (or GEOG) 316 and 317 (i.e. the prerequisites to this course) or equivalent and prior GIS experience, like on-the-job experience. The following are some (but not limited to) expectations of students upon the first day of class (all are equally important):

- Must be a highly motivated student and take into great consideration that this is an online course. Instructor will not be available to answer emails late at night and may not be available to answer emails over the weekend, holidays and breaks. Student must take into great consideration that troubleshooting over the phone may be very difficult in communicating GIS workflows and processes. It is strongly encouraged as well as expected that the student be very familiar with computer terminology at this course's skill level.
- Student's computer must be up-to-date and meet the following requirements:
    - ArcGIS for Desktop requirements, click here and
    - ArcGIS Pro requirement, click here.
- Must have a reliable and dependable access to broadband Internet, no exemptions.
- Must transfer skills and knowledge obtained in GISC (or GEOG) 316 and 317 (i.e., the prerequisites to this course) or equivalent and prior GIS experience. This course expects the student to \hit the ground running" with a series of projects and labs without having to reteach prior GIS concepts and skills.
- Be able to ask your favorite Internet search engine a question on how to do what in ArcGIS for Desktop or equivalent and other GIS software and use other resources such as ArcGIS Desktop Help and notes from GISC (or GEOG) 316 and 317 or equivalent and prior GIS experience. For example, to browse ArcGIS Desktop help, go to Start | Programs | ArcGIS | ArcGIS Desktop Help, or go to the ArcGIS Desktop Resource Center (for ArcGIS for Desktop tutorial, click here) for help with recalling functions, procedures, methods, and tools used in GISC (or GEOG) 316 and 317 or equivalent and prior GIS experiences a result of being forgotten or just to refresh the memory. (I'm guilty of forgetting and I use these resources all the time to \relearn" because there are certain tools in ArcGIS that I don't use every day - that's just a fact of life.) It's fair to state that the Instructor should not be spending time inclass \reteaching" basic knowledge and skills acquired in GISC (or GEOG) 316 and 317 materials or equivalent and prior GIS experience. When seeking additional help on content or technical skills that may or not have been covered in your GISC (or GEOG) 316 or 317 class or equivalent and prior GIS experience, it's fair to state that the student must first give an effort and be prepared to present that effort while visiting your instructor. Try this, type the following without quotes in google.com: "how to make a shapefile in arcgis pro" - go ahead and give it a try, don't be shy in asking your Internet search engine a question on how to do something in ArcGIS or any other software.
- Must want to learn GIS, extend your knowledge in GIS, appreciate GIS, and further your understanding of GIS even if GIScience is not your major or not pursuing GIS as a profession. In other words, must have an interest in GIS and you are not enrolled in this course because simply \somebody" said that it would get you a job! This course gives the student an opportunity to show off and practice their GIS skills with confidence since the student already has eight credit hours of GIS or equivalent and prior GIS experience; not relearn GISC (or GEOG) 316 and 317 materials all over again. This course should not be thought of as GISC (or GEOG) 316 part 2 or 3 or GISC (or GEOG) 317 part 2.
- Must be able to write in a professional manner at the expectations of an undergraduate college senior. (Graduate students taking this course for graduate credit will be expected to write at the level of a graduate student.) This course has three lab write-ups: (1) technical instructions; (2) 3D lab write-up; and (3) group project (or final project) write-up. The write-ups will utilize figures in a professional manner created from screenshots. Screenshots are expected to be clipped and designed well to effectively communicate the issue at hand (i.e., not to take a screenshot for the sake of taking a screenshot because the instructor expects it).
- **Must concur to the naming conventions for files and folders at all times**, even when processing on your personal computer in a strong effort to avoid errors from happening! The naming conventions for folders must not exceed 8 characters and for files must not exceed 13 characters. The following is not allowed for characters used in the names for both files and folders: (1) a symbol (e.g.,

c:\Labn#1), (2) a space (e.g., c:\Project 1nLab 1); (3) begin with a number (e.g., d:\1projectn1labn1stday); and folder names in the path of the working directory must concur to all the rules above (i.e., do not paste GIS data to the desktop or to the 'documents and settings' directory).

- Must know file management proficiently and use Windows Explorer effectively for file management when working with GIS data.
- Must understand relative paths when saving a project file (.mxd or .arpx) and how to pull it up on another computer error free. No exceptions! If the instructor receives red exclamations marks in the ToC of ArcMap (or ArcScene) upon opening their mxd, the instructor will not play hide-and-seek with the student's data sources. The student will then be given another chance to resubmit.
- Be comfortable in working with vector data, including digitizing and manipulating attribute tables at any given notice. This includes \planarizing" line features with the planarize tool from the topology toolbar. Check this out, type without quotes \how to planarize lines in ArcMap" into google.com.
- Be able to zip files into a compressed file (.zip). If any of the above proves to be challenging, the student is to reconsider enrolling in this course and/or seek advice from instructor. An online ESRI course as a \refresher" can be given out to the student before the first day of class.

CLASS FORMAT:

GISC 417 On Demand is delivered and taught through BlackBoard (or BB) (https://blackboard.wku.edu/). BB will contain reading assignments, assignments and project labs. Reading assignments will focus on the conceptual basis of GIS analysis, introducing concepts and principles needed for effective GIS use. Students should take notes and keep a journal for this component of class. Assignment will allow the student an opportunity to understand processes thoroughly and practice to gain confidence required for project labs. The project lab component provides students with practice applying software applications to a variety of real-world problems. Note that some project assignments will require time outside of class to complete. Auditing of this course is not allowed!

ATTENDANCE:

Regular weekly logging into Blackboard is expected. Blackboard keeps a record of each time you log into your Blackboard account. The student is responsible for all lecture notes, materials, etc.

WKU CENTER for LITERACY ASSISTANCE:

The WKU Center for Literacy is located in Gary A. Ransdell Hall 2066. At WKU's Center for Literacy, students can receive assistance in developing strategies to help reading/studying to learn and writing for evidence and argument. The Center for Literacy offers both individual and small group sessions throughout the semester. More information about the WKU Center for Literacy can be found on the website: http://www.wku.edu/literacycenter/

GRADE DETERMINATION:

Your grade for this course will be based upon evaluation of your performance with respect to the following items:

1. three exams for a combined weight of 45% (or 15% each) of your final grade;
2. a set of assignments and quizzes for a combine weight of 10% of your final grade; and
3. projects for a combined weight of 45% (or 15% each) of your final grade.

Letter grade determination: **90% ≤ A ≤ 100%**; **80% ≤ B < 90%**; **70% ≤ C < 80%**; **60% ≤ D < 70%**; and **0 ≤ F < 60%**.

LAB PROJECTS:

Lab projects utilize specific GIS techniques to problems in a variety of application areas. Students should start early on these assignments to allow time for overcoming unanticipated problems. Labs are due on the due date assigned in class. If a student will be absent on the due date of an assignment, the assignment must be turned in ahead of time to be counted as on time! Late labs will be penalized half a letter grade or 5% for each day after the due date. Since this is a lab-based course, students must complete all labs to pass this course. Labs will be graded on the correctness of the solution and how well the solution is communicated in a map or lab write-up.

EQUIPMENT:

Since this course is a project-based course simulating real-word scenarios in GIS, the following equipment is important:

- **GPS such as a Smart Phone (Required)**: A mobile device for collecting absolute locations (i.e., latitude & longitude) such as a smart phone or handheld GPS unit. Data collection will begin during the middle of the course and carry onwards for another two weeks or so as part of your last lab project; and may be needed again for further correction out in the field.
- **QGIS**: This is open source software, i.e., available for free. Download the long-term release repository (most stable). For QGIS Standalone Installer, click here.
- **ArcGIS Pro**: Please contact Instructor before semester begins in regards to getting a free student copy of the software. You will also need to request a WKU ArcGIS Online Organizational account. For ArcGIS Pro FAQ and troubleshooting, click here.
- **ArcGIS for Desktop**: Please contact Instructor before semester begins in regards to getting a free student copy of the software. When you install the student version you must do a complete install, no exceptions; this will install all the extensions! Install before the first week of class.
    - For ArcGIS for Desktop FAQ and troubleshooting, click here.
    - Install as soon as possible! As for the ArcInfo license, if you are near one of WKU's extension campus, the labs are equipped with ArcInfo license and if not then you may be fortunate to know somebody that does know how in a related GIS shop.
    - If all else fails with accessing a machine with an ArcInfo license then let me know when the time arrives, i.e., you will know because the operation performed will state that you need an ArcInfo license.
    - If you are in need to migrate back and forth from different versions of ArcGIS Desktop (e.g., 9.3 to 9.2 to 9.3.1 to 10) while completing your project then you will need to save your .mxd (or .arpx) by clicking on \File" in the main menu of ArcMap and selecting \Save A Copy." In the \Save A Copy" window, change the \Save as type:" to the appropriate version. Newer versions of ArcGIS Desktop can read any (or older) .mxd (or .arpx) project files, but ArcGIS Desktop is not backwards compatible with its project files (.mxd or .arpx)!

EXAMS:

Exam 3 is proctored. You will need to contact our Division of Extended Learning and Outreach (DELO): http://www.wku.edu/testing/ There are various options for you on where you can take your exam, but be proactive now so that you don't put yourself in a bad position when examination arrives by familiarizing yourself with the procedure.

WITHDRAWAL from COURSE:

WKU On Demand courses **have different policies than your regular WKU classes** so please read the Student Guidelines & Procedures by filling out the Course Withdrawal Form by clicking here. A grade of "W" will appear on the transcript if the student withdraws from the course within the first four months of enrollment. Please be advised that there may be a withdrawal fee assessed to the student if they withdraw after the first week. **A student may not withdraw from their course (1) after the first four months of enrollment, (2) after having taken their final exam, or (3) completed all the course work required."**

ON DEMAND GENERAL STUDENT GUIDELINES & PROCEDURES:

WKU On Demand recognizes the need of many individuals to pursue educational experiences outside the traditional college classroom. It is education delivered any day, any time, and anywhere. For more infor- mation on WKU On Demand's guidelines and procedures, it can be found by clicking here.

STUDENT RESOURCES PORTAL:

To help you succeed, there is a Student Resource Portal (or SRP) that you may access by clicking here. The SRP connects you with more than sixty-five resources designed specifically for online learners with a sin- gle-click! The Portal can also be accessed at any time through this course's Blackboard web site.

POLICIES:

The Department of Geography and Geology strictly adheres to university policies, procedures, and dead- lines regarding student schedule changes. It is the sole responsibility of the student to meet all deadlines in 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 docu- mentation. Poor academic performance, general malaise, or undocumented general stress factors are not considered as legitimate circumstance.

ADA ACCOMODATION:

In compliance with University policy, students with disabilities who require academic and/or auxiliary ac- commodations (academic adjustments and/or auxiliary aids or services) for this course must contact the Student Accessibility Resource Center located in Downing Student Union, 1074. SARC can be reached by phone number at 270-745-5004 [270-745-3030 TTY] or via email at sarc.connect@wku.edu. Please do not request accommodations directly from the professor or instructor without a faculty notification letter(or FNL) from The Student Accessibility Resource Center.

TITLE IX SEXAUAL MISCONDUCT/ASSAULT POLICY:

Western Kentucky University (WKU) is committed to supporting faculty, staff and students by upholding WKU's Title IX Sexual Misconduct/Assault Policy (#0.2070) and Discrimination and Harassment Policy (#0.2040). 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.