

UP 7130 & GPH 4600
Advanced Geographic Information Systems

Fall Term 2023
Urban Studies & Planning
Wayne State University

Instructor

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Office hours by appointment through Zoom

Course Description

The course provides students with an understanding of advanced GIS methods, and the ability to interpret results from geographic research. Students will have weekly hands-on demonstrations and they will go through tutorials from the assigned text. In our work, we will go through examples that will solve and answer geographic related questions. And we will learn how to interpret and understand spatial patterns in data. All demonstrations and tutorials will use the ArcGIS Pro application from Esri. Topics covered will include map overlays, proximity/network/surface/raster analysis, online web maps and data management.

All students will work on a GIS location analysis project that will focus on point features. The project will cover a topic that will be of interest to the student. Required GIS tools, analysis, and maps will be specified by the instructor. Students will define, create, and complete a project that is both manageable and realistic for the semester. The instructor will guide students along in helping them complete all phases of their project.

Students will incorporate advanced analytical tools in their project work. This will include overlay, raster and network analysis tools that will be used to analyze point locations. All work will be documented in a comprehensive research paper providing step-by-step instructions for each phase of the project. And it will include maps that will display their findings for each part of the analysis. A research poster will also be created to highlight their work. It will include maps, visual observations from the maps, and charts summarizing data based on geography.

The course provides a good opportunity to gain experience and apply GIS in solving practical geographic problems in the student's field of study. Successful completion of the course will provide students with proficient GIS analytical skills and geographic

problem-solving abilities that will allow them to understand and explain spatial patterns found in geographic data created and analyzed from their research.

Learning Outcomes

Advanced GIS is designed to provide students with an understanding of advance theories and analytical methods available in spatial analysis, and the ability to apply these learnings and interpret spatial findings in their research for work in their chosen careers where geographic analysis is needed. Students will be proficient in using advance GIS tools and research methods upon successful completion of the course. They will understand how to examine the methodologies available to plan, execute and manage a project, and the tasks involved to complete it. They will be able to understand and explain geographic patterns discovered from the spatial data in their research.

Key learning outcomes include the following:

1. Awareness and the ability to interpret spatial patterns in geographic data
2. Ability to evaluate geographic data to determine its value in research
3. Knowledge and comprehension of advance GIS tools and the ability to apply them sufficiently in geographic research
4. Ability to evaluate GIS analytical methods to determine best practices in solving geographic specific problems
5. Gain curiosity in exploring geographic data, manipulating the data, and experimenting with GIS tools to help answer geographic related questions

Course Format

The course will be taught through asynchronous online learning. All course materials will be made available on Canvas. Demonstrations will be made through Echo360 recordings. And a course Discussion board will be made available for students to ask questions.

Students are required to have their own access to the ArcGIS Pro application. It will be made available for you to install on your computer. It is a Windows program, and it will not operate on a Mac. Access to a university computer through a VMware connection with the application installed will be available as a second option. You will use ArcGIS Pro to complete class demonstrations, assigned tutorials and a class project. You will not be able to complete the class without the ArcGIS Pro application.

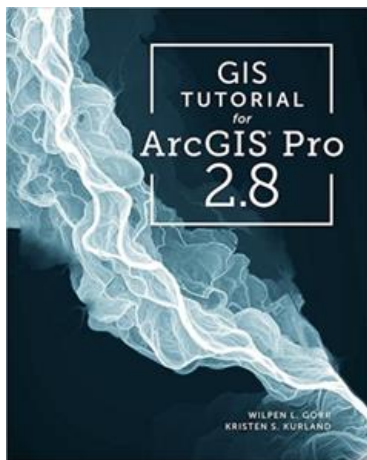
If you do not have a computer capable of running ArcGIS Pro or accessing it through a VMWare connection, please take the class later when it is offered on campus. An announcement will be made that will provide you the requirements needed for your computer. You will need to check your computer's specifications immediately with the software requirements. And check to see if you are able to access the application

through our VMWare connection. An announcement will be sent on how to do this too.

Required Text

Note: The 3.1 version of the book will be available September 19, 2023. We will not be using the 3.1 version of the book. The release date does not allow me time to review it and update questions if necessary. Regarding the ArcGIS Pro application, you will not see many noticeable differences between the 2.8 and 3.1 version. For what is new in 3.1, see the following.

[What's new in ArcGIS Pro 3.1–ArcGIS Pro | Documentation](#)[Links to an external site.](#)



GIS Tutorial for ArcGIS Pro 2.8

by Wilpen L. Gorr, Kristen S. Kurland

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Data required to go through the tutorials in the book can be found in the Modules section on Canvas. It is titled "Exercise Data for GIS Tutorial for ArcGIS Pro 2.8." You will need to download the compressed file to your computer.

Grading

Grades are based on the following assignments. Due dates are listed on Canvas for each assignment.

Assignment	Percent (%)
(1) "GIS Tutorial for ArcGIS Pro" Chapters 1-6 Questions	20
(2) "GIS Tutorial for ArcGIS Pro" Chapters 7-11 Questions	20
(3) Project Document Paper	30
(4) Project Research Poster	10
(5) ArcGIS Pro Demonstrations 1-5 Maps	10
(6) ArcGIS Pro Demonstrations 6-11 Maps	10

Schedule

Demonstration Topics & Objectives – under each topic, the tools that will be covered are listed. They will be used to solve a geographic related problem presented by the instructor for each demonstration.

Week 1 - August 28 - September 1 Course Introduction ArcGIS Pro Introduction <ol style="list-style-type: none">1. Create a project2. Map and scene properties3. Layer properties4. Contents Pane5. Catalog Pane6. File geodatabase	Week 2 - September 4 - 8 ArcGIS Pro Demonstration One Analyzing Point Features <ol style="list-style-type: none">1. Kernel Density2. Spatial Join3. Optimized Hot Spot Analysis4. Create Thiessen Polygons
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<ul style="list-style-type: none"> 7. Geoprocessing 8. Layouts 	<ul style="list-style-type: none"> 5. Generate Near Table 6. Generate Origin-Destination Links 7. Central Feature 8. Directional Distribution
<p>Week 3 - September 11 - 15</p> <p>ArcGIS Pro Demonstration Two</p> <p>Location Analysis & Model Builder</p> <ul style="list-style-type: none"> 1. Buffer 2. Select Layer by Location 3. Feature To Point 4. Intersect 5. Summary Statistics 6. Model Builder <ul style="list-style-type: none"> 1. Buffer 2. Intersect 3. Summary Statistics 	<p>Week 4 - September 18 - 22</p> <p>ArcGIS Pro Demonstration Three</p> <p>Proximity & Overlay Analysis</p> <ul style="list-style-type: none"> 1. Buffer 2. Count Overlapping Features 3. Create Thiessen Polygons 4. Clip 5. Calculate Geometry Attributes 6. Euclidean Distance 7. Intersect 8. Union 9. Summarize Within 10. Network Analyst <ul style="list-style-type: none"> 1. Service Area 2. Route
<p>Week 5 - September 25 - 29</p> <p>ArcGIS Pro Demonstration Four</p> <p>Raster Analysis</p> <ul style="list-style-type: none"> 1. Kernel Density 2. Extract by Mask 3. Reclassify 4. Weighted Sum 5. Raster to Polygon 6. Feature to Point 	<p>Week 6 - October 2 - 6</p> <p>Due: "GIS Tutorial for ArcGIS Pro" Chapters 1-6 Q Monday, October 2, 2023 by 11:59 pm</p> <p>ArcGIS Pro Demonstration Five</p> <p>Labels, Annotation & Scale Ranges</p> <ul style="list-style-type: none"> 1. Labeling basics 2. Label Classes 3. Formatting labels 4. Label settings 5. Prioritize labels 6. Weight labels 7. Convert labels to annotation 8. Edit annotation 9. Create scale ranges

<p>Week 7 - October 9 - 13</p> <p>Due: ArcGIS Pro Demonstrations 1-5 Maps, Monday, October 9, 2023 by 11:59 pm</p> <p>ArcGIS Pro Demonstration Six</p> <p>Georeferencing & Edit Tools</p> <ol style="list-style-type: none"> 1. Geocoding an address list 2. Georeference a graphic file 3. Create point features 4. Create line features 5. Create polygon features 6. Digitize features 7. Edit features 8. Edit attributes 	<p>Week 8 - October 16 - 20</p> <p>ArcGIS Pro Demonstration Seven</p> <p>ArcGIS Online</p> <ol style="list-style-type: none"> 1. Layer Package 2. Web Layer 3. Create web map 4. Web map basics 5. Create a dashboard 6. Dashboard basics
<p>Week 9 - October 23 - 27</p> <p>ArcGIS Pro Demonstration Eight</p> <p>Surface Analysis & Hydrology</p> <ol style="list-style-type: none"> 1. Aspect 2. Hillshade 3. Slope 4. Surface Parameters 5. Contour 6. Fill 7. Flow Direction 8. Flow Accumulation 9. Snap Pour Point 10. Watershed 	<p>Week 10 - October 30 - November 3</p> <p>ArcGIS Pro Demonstration Nine</p> <p>Network Analysis</p> <ol style="list-style-type: none"> 1. Service Area 2. Route 3. Closest Facility 4. Location Allocation 5. Origin Destination 6. Vehicle Routing
<p>Week 11 - November 6 - 10</p> <p>ArcGIS Pro Demonstration Ten</p> <p>Map Tips, Attachments & Popups</p> <ol style="list-style-type: none"> 1. Show Map Tips 2. Configure Pop-ups 3. Enable Attachments 	<p>Week 12 - November 13 - 17</p> <p>Due: "GIS Tutorial for ArcGIS Pro" Chapters 7-11 Monday, November 13, 2023 by 11:59 pm</p> <p>ArcGIS Pro Demonstration Eleven</p> <p>Layouts & Map Series</p> <ol style="list-style-type: none"> 1. Generate Reports

<p>4. Generate Attachments Match</p>	<ol style="list-style-type: none"> 2. Layout properties 3. Map Frames 4. Extent Indicator 5. Legend properties 6. Dynamic Text 7. Scale Bar properties 8. North Arrow properties 9. Graticule 10. Map Series properties
<p>Week 13 - November 20 - 24</p> <p>Holiday - no class</p>	<p>Week 14 - November 27 - December 1</p> <p>Due: ArcGIS Pro Demonstrations 6-11 Maps, Monday, November 27, 2023 by 11:59 pm</p> <p>Work on GIS location analysis project</p>
<p>Week 15 - December 4 - 8</p> <p>Due: Project Document Paper and Project Research Poster, Monday, December 4, 2023 by 11:59 pm</p>	<p>Week 16 - December 11 - 15</p> <p>No class</p>

Academic Dishonesty

(Edited statement from the DOSO's web site)

All forms of academic misbehavior are prohibited at Wayne State University, as outlined in the Student Code of Conduct. Students who commit or assist in committing dishonest acts are subject to downgrading (to a failing grade for the test, paper, or other course-related activity in question, or for the entire course) and/or additional sanctions as described in the Student Code of Conduct.

- Cheating: intentionally using or attempting to use, or intentionally providing or attempting to provide, unauthorized materials, information, or assistance in any academic exercise. Examples include: (a) copying from another student's test paper; (b) allowing another student to copy from a test paper; (c) using unauthorized material such as a "cheat sheet" during an exam.
- Fabrication: intentional and unauthorized falsification of any information or citation. Examples include: (a) citation of information not taken from the

source indicated; (b) listing sources in a bibliography not used in a research paper.

- Plagiarism: to take and use another's words or ideas as one's own. Examples include: (a) failure to use appropriate referencing when using the words or ideas of other persons; (b) altering the language, paraphrasing, omitting, rearranging, or forming new combinations of words in an attempt to make the thoughts of another appear as your own.
- Unauthorized reuse of work product: submission for academic credit, without the prior permission of the instructor, of substantial work previously submitted for credit in another course. Example: submitting a paper in a current course that was written for, and submitted in, a previous course.
- Other forms of academic misbehavior include, but are not limited to: (a) unauthorized use of resources, or any attempt to limit another student's access to educational resources, or any attempt to alter equipment so as to lead to an incorrect answer for subsequent users; (b) enlisting the assistance of a substitute in the taking of examinations; (c) violating course rules as defined in the course syllabus or other written information provided to the student; (d) selling, buying or stealing all or part of an un-administered test or answers to the test; (e) changing or altering a grade on a test or other academic grade records

Student Disabilities Services

(Edited statement from the SDS web site)

If you have a documented disability that requires accommodations, you will need to register with Student Disability Services (SDS) for coordination of your academic accommodations. The SDS office is located in the Adamany Undergraduate Library. The SDS telephone number is 313-577-1851 or 313-577-3365 (TTD only). Once you have your accommodations in place, I will be glad to meet with you privately during my office hours or at another agreed upon time to discuss your needs.

Students who are registered with Student Disability Services and who are eligible for alternate testing accommodations such as extended test time and/or a distraction-reduced environment should present the required test permit to the professor at least one week in advance of the exam. Federal law requires that a student registered with SDS is entitled to the reasonable accommodations specified in the student's accommodation letter, which might include allowing the student to take the final exam on a day different than the rest of the class.