GIS 5505: Population GIS

Department of Geography

College of Liberal Arts & Sciences, University of Florida

COURSE SYLLABUS

Instructor:	Dr. Kevin Ash	Term:	Fall 2025
Office:	TUR 3128	Class Meeting Days:	Wednesday
Phone:	352-294-6956	Class Meeting Hours:	1:55 – 4:55 pm
Email:	kash78@ufl.edu	Class Location:	TUR 3006
Office Hours:	Tues & Thurs, 9-10:30 am; or by appt	Course Credits:	3 hours

I. Course Overview

This course provides students with basic skills and knowledge to utilize Geographic Information Systems (GIS) to map and analyze population data in geospatial formats that are widely available in the United States and many countries globally from public sources such as censuses and population surveys. Students will benefit from lab assignments using the software ArcGIS Pro, including advanced data processing and analysis functionality using ModelBuilder and ArcPy Notebooks. This course is designed to build upon human geography and population concepts learned in lower-level courses by empowering students to perform their own analyses of population data in various geographic contexts. The course thereby will provide critical training and experience for students interested in pursuing more advanced applications of GIS utilizing geospatial population data to model more complex societal and environmental processes and phenomena.

The first several weeks of the course will familiarize students with geospatial formats common for secondary population datasets such as census enumeration data and the American Community Survey. Early assignments will instruct students on how to retrieve these population data, display and analyze them in GIS, and how to conduct appropriate data processing steps such as data normalization in the form of rates, percentages, or ratios. Students will also learn to think critically about analysis and display of population data, including how to handle margins of error and mapping in areas with small sample sizes using smoothing methods. In the latter half of the course, students will learn how to conduct longitudinal change analyses with geospatial population datasets. In the final weeks of the course, we will cover multiple methods for mapping population density and measures of rurality with GIS data and will learn how to calculate and map sociodemographic indicators pertaining to concepts such as poverty and income inequality. In the final assignment, students will conduct geodemographic classification using GeoAI clustering methods.

NOTE: This course is co-listed with GIS 4500 which is an undergraduate course. While the two courses will run concurrently and complete similar assignments and exams, undergraduate and graduate students will be evaluated on different bases. Graduate students will be required to contribute more often and in greater depth for written and verbal reading discussions, complete a longer and more rigorous final project paper, and deliver a longer and more comprehensive final project presentation.

II. Course Content Objectives

By the end of the course, students will:

- Demonstrate proficiency with ArcGIS Pro software for mapping and analysis of population, demographic, and socioeconomic data.
- Identify and utilize public population data sources for geospatial analyses
- Extend understanding of concepts in population geography—such as demographic trends, urban/rural differences, and socioeconomic inequality—through application of these concepts in quantitative and geospatial analyses

- Compare and contrast methodologies for the calculation and analysis of demographic and socioeconomic quantitative indicators
- Write a project paper in the style of a peer-reviewed scientific manuscript
- Give an oral and visual presentation to communicate their research methods and findings
- Constructively review and discuss recently published peer-reviewed journal articles on the topics of population geography, GIS, and GeoAI

III. Student Learning Outcomes

Through the course assignments and exams, students will learn to:

- Independently obtain, process, and map data generated through publicly available censuses and population surveys
- Organize, visualize, and analyze population, demographic, and socioeconomic data using ArcGIS Pro
- Conduct population analyses using a variety of geographic enumeration units
- Normalize population data using appropriate denominators, according to data quality and research goals
- Interpret and formulate conclusions with data that explicitly include uncertainty (survey margins of error)
- Understand and apply geographic data smoothing techniques
- Utilize historical census and survey data for calculation and analyses of population trends
- Map population density using a variety of cartographic techniques, including dasymetric methods
- Define, quantitatively estimate, and map population geographic patterns of rurality, human well-being, and poverty
- Generate a geodemographic classification using GeoAI methods

IV. Materials and Supplies: Laptop Computer

This course will be held in TUR 3006 for the Fall 2025 semester. Students are advised to provide their own laptop computer on which to participate in discussions on Canvas prior to class, work on GIS assignments during and outside of class, and take exams via Canvas. Any required software (such as ArcGIS Pro) will be available to students through UF Apps at https://info.apps.ufl.edu or through student licenses provided by the instructor. There are computer terminals in the classroom that will be available during class; however, these will not always be accessible outside of class hours due to other courses that meet in the room.

V. Required Texts and Useful Online Resources

There is no required textbook for this course. The instructor will assign readings on a weekly basis and these will be available via Canvas. Citations for the required readings are provided at the end of this document.

VI. Course Format, Activities, and Basis for Evaluation

The class will meet once per week for a three-hour time block on Wednesdays from 1:55 pm to 4:55 pm. The three-hour period will be a mixture of lectures, discussion of assigned readings, and time to work on each week's GIS assignment. NOTE: The instructor will give the lectures live in TUR 3006 but will also record these lectures using Zoom and make them available via Canvas to all students in the class for study & review purposes only; these recordings are not to be distributed publicly or made available to anyone outside the course without the written permission of the instructor. To clarify: this is not a HyFlex course. Students are expected to attend class in TUR 3006 unless they have documented reasons for absence.

The camera will remain on the instructor during lecture recordings. Students are still encouraged to ask questions during the lectures. The reason for recording lectures is to provide students with the opportunity to re-watch lectures to better learn the concepts and methods in the course, as there is no textbook for this course.

Evaluation and Grading

Reading Discussions: Discussion of the weekly readings in written format on Canvas and verbally during class will comprise 30% of the course grade. Students will be required to post written summaries/critiques on Canvas the day before class and discuss the papers further during class periods. Then, students must complete a short, written reflection the day after class, again via Canvas. An evaluation rubric is provided on the course Canvas page.

GIS Assignments: There will be 10 GIS assignments which will amount to 40% of the final grade. GIS assignments will be due one week after they are assigned; exceptions to this are noted in the course schedule. The grade will be determined using the best 9 grades out of the 10 assignments, with the lowest grade being dropped.

Final Project: For the final project, students will use one or more of the GIS methods for analysis of population data covered in the course to perform their own analysis for a location and context of their choosing. The final project paper should be about 3000 words in length and include citations, data tables, and maps and graphs as appropriate. The project will be worth 30% of the total grade. Most of the points (25 out of the 30 percentage points) will be related to the paper which each student will write and turn in by December 10th. The remaining 5 percent will be for a 12-minute presentation given on December 3rd. Students will write a short project proposal that will be due October 29th and will receive constructive feedback and guidance about the proposed research. More detailed instructions about the final project will be provided to students via Canvas and during class meetings.

Assignments and Exams	Percent of Final Grade
Participation & Reading Discussions	30%
GIS Assignments	40%
Final Project Presentation	5%
Final Project Paper	25%

Grading Scale (%)	
92.5 – 100	A
89.5 – 92.4	A-
86.5 – 89.4	B+
82.5 – 86.4	B
79.5 – 82.4	B-
76.5 – 79.4	C+
72.5 – 76.4	C
69.5 – 72.5	C-
66.5 – 69.4	D+
62.5 – 66.4	D
59.5 – 62.4	D-
< 59.5	E

VII. **Important Dates to Remember:** The due dates below are tentative and can be changed at the discretion of the instructor.

First Class Period:	Wed, Aug 27th, 2025
Drop/Add Ends:	Fri, Aug 29th 2025
Final Project Proposal Due	**Wed, Oct 29th 2025**
Thanksgiving Break	Mon-Fri, Nov 24-28th 2025
Reading Days	Thurs-Fri, Dec 4–5th 2025
Final Project Paper Due	**Wed, Dec 10th 2025**
Fall 2025 Grades Available on https://one.uf.edu/dashboard/	Wed, Dec 17th 2025

VIII. Academic Policies:

This course complies with all UF academic policies. For detailed information on those policies and to find additional resources for students, please go to https://syllabus.ufl.edu/syllabus-policy/uf-syllabus-policy-links/.

IX. Weekly Topic Schedule, Assignments, and Exams (Schedule is provisional and subject to change)

Date	Day	Class Topics & Assignments	Read Before Class
Aug 27	Wed	Course Introduction; GIS Assignment #1	None
Sep 3	Wed	Working with Census Datasets in GIS; GIS Assignment #2; Assignment #1 due	Logan 2018; Morckel 2025
Sep 10	Wed	Data Standardization in GIS; GIS Assignment #3; Assignment #2 due	Cresswell et al. 2023; Karaye et al. 2023
Sep 17	Wed	American Community Survey, Uncertainty, & GIS; GIS Assignment #4; Assignment #3 due	Jurjevich et al. 2018; Boscoe et al. 2022
Sep 24	Wed	Small Area Estimation & Geographic Data Smoothing; GIS Assignment #5; Assignment #4 due	Johnson et al. 2022; Saunders et al. 2023
Oct 1	Wed	Methods for Mapping Population Density; GIS Assignment #6; Assignment #5 due	Jia et al. 2014; Wardrop et al. 2018
Oct 8	Wed	Measuring & Mapping Rurality Using GIS; GIS Assignment #7; Assignment #6 due	Inagami et al. 2016; Fischer et al. 2024
Oct 15	Wed	Longitudinal Population Change Using GIS; GIS Assignment #8; Assignment #7 due	McKee et al. 2015; Markley et al. 2022
Oct 22	Wed	Introduction of Final Project; Work on Project Proposal; Assignment #8 due	None
Oct 29	Wed	Mapping the Human Development Index; GIS Assignment #9; project proposal due	Hou et al. 2015; Permanyer and Suppa 2022
Nov 5	Wed	GIS and Indices of Poverty & Deprivation; GIS Assignment #10; Assignment #9 due	Mayhew et al. 2023; Beauchamp et al. 2024
Nov 12	Wed	GIS & Inequality Measures; Assignment #10 due; Work on final project	Florida & Mellander 2016; Cohen et al. 2023
Nov 19	Wed	Geodemographic Regionalization; Work on final project	Major et al. 2018; Baiocchi et al. 2022
Dec 3	Wed	Student presentations on final project; Work on final project papers	None
Dec 10	Wed	***Final Project Papers Due by 11:59 pm on December 10***	

X. Assigned Readings Citations:

Baiocchi, G., K. Feng, K. Hubacek, and C. Walters, 2022. Carbon footprint of American lifestyles: a geodemographic segmentation approach, *Environmental Research Letters*, 17:064018.

Beauchamp, A.M., G.C. Shen, S.H. Hussain, A. Adam, L. Highfield, and K. Zhang, 2024. Cultural context index: A geospatial measure of social determinants of health in the United States, *SSM-Population Health*, 25:101591.

Boscoe, F.P., B. Liu, J. Lafantasie, L. Niu, and F.F. Lee, 2022. Estimating uncertainty in a socioeconomic index derived from the American Community Survey, *SSM-Population Health*, 18:101078.

Cohen, S.A., C.C. Nash, E.N. Byrne, and M.L. Greaney, 2023. Income and rural–urban status moderate the association between income inequality and life expectancy in US census tracts, *Journal of Health, Population and Nutrition*, 42:24.

Cresswell, K., D. Mitsova, W. Liu, M. Fadiman, and T. Hindle, 2023. Gauging Heat Vulnerability in Southeast Florida: A Multimodal Approach Integrating Physical Exposure, Sensitivity, and Adaptive Capacity, *International Journal of Geo-Information*, 12:242.

Florida, R., and C. Mellander, 2016. The geography of inequality: Difference and determinants of wage and income inequality across US metros, *Regional Studies*, 50:79-92.

Hou, J., P.P. Walsh, and J. Zhang, 2015. The dynamics of Human Development Index, *The Social Science Journal*, 52:331-347.

Inagami, S., S. Gao, H. Karimi, M.M. Shendge, J.C. Probst, and R.A. Stone, 2016. Adapting the Index of Relative Rurality (IRR) to Estimate Rurality at the ZIP Code Level: A Rural Classification System in Health Services Research, *The Journal of Rural Health*, 32:219-227.

Jia, P., Y. Qiu, and A.E. Gaughan, 2014. A fine-scale spatial population distribution on the High-resolution Gridded Population Surface and application in Alachua County, Florida, *Applied Geography*, 50:99-107.

Johnson, G.D., M. Checker, S. Larson, and H. Kodali, 2022. A small area index of gentrification, applied to New York City, *International Journal of Geographical Information Science*, 36:137–157.

Jurjevich, J.R., A.L. Griffin, S.E. Spielman, D.C. Folch, M. Merrick, and N.N. Nagle, 2018. Navigating Statistical Uncertainty: How Urban and Regional Planners Understand and Work with American Community Survey (ACS) Data for Guiding Policy, *Journal of the American Planning Association*, 84:112–126.

Karaye, I.M., N. Maleki, N. Hassan, and I. Yunusa, 2023. Trends in Alcohol-Related Deaths by Sex in the US, 1999–2020, *JAMA Network Open*, 6:e2326346.

Logan, J.R., 2018. Relying on the Census in Urban Social Science, *City & Community*, 17:540-549.

Major, E., E.C. Delmelle, and E. Delmelle, 2018. SNAPScapes: Using Geodemographic Segmentation to Classify the Food Access Landscape, *Urban Science*, 2:71.

Markley, S.N., S.R. Holloway, T.J. Hafley, and M.E. Hauer, 2022. Housing unit and urbanization estimates for the continental U.S. in consistent tract boundaries, 1940–2019, *Scientific Data*, 9:82.

Mayhew, M., A. Denton, A. Kenney, J. Fairclough, A. Ojha, P. Bhoite, M.T. Hey, R. Seetharamaiah, S. Shaffiey, and G.W. Schneider, 2023. Social deprivation, the Area Deprivation Index, and emergency department utilization within a community-based primary and preventive care program at a Florida medical school, *Journal of Public Health*, 32:827–835.

McKee, J.J., A.N. Rose, E.A. Bright, T. Huynh, and B.L. Bhaduri, 2015. Locally adaptive, spatially explicit projection of US population for 2030 and 2050, *Proceedings of the National Academy of Sciences*, 112:1344-1349.

Morckel, V., 2025. Population decline and data discrepancies: evaluating ACS estimates and comprehensive plan projections for a subset of U.S. shrinking cities, *Planning Practice & Research*, 40:954–964.

Permanyer, I., and N. Suppa, 2022. Racing ahead or lagging behind? Territorial cohesion in human development around the globe, *Regional Studies*, 56:2086–2101.

Saunders, M.E., J.L. Humphrey, and B.H. Lambdin, 2023. Spatiotemporal Trends in Three Smoothed Overdose Death Rates in US Counties, 2012–2020, *Preventing Chronic Disease*, 20:220316.

Fischer, A., J.M.S. Hutchinson, and K.S. Nelson, 2024. Where is rural? An analysis of the agreement between quantitative measures of rurality, *Journal of Rural Studies*, 111:103424.

Wardrop, N.A., W.C. Jochem, T.J. Bird, H.R. Chamberlain, D. Clarke, D. Kerr, L. Bengtsson, S. Juran, V. Seaman, and A.J. Tatem, 2018. Spatially disaggregated population estimates in the absence of national population and housing census data, *Proceedings of the National Academy of Sciences*, 115:3529-3537.