GEOG3433 Applied Geostatistics for Urban Studies

 # Fulfill requirements of method-related courses

TIMETABLE ARRANGEMENT: Annual; 2nd Semester   **CREDITS:** 6

COURSE TEACHER: Professor Yuyu ZHOU

ASSESSMENT:

EXAMINATION 60 %	COURSEWORK 40 %
• 2 hours	• Lab exercise • Individual project

OBJECTIVES:

The objectives of this course are to help students acquire fundamental geostatistical theory, develop practical skills, and explore advanced geospatial techniques. The course is designed to offer a comprehensive understanding of various aspects of geospatial data in the context of urban studies. It will cover topics such as descriptive and inferential spatial statistics, exploratory data analysis, spatial autocorrelation and interpolation, spatial-time analysis, spatial machine learning, and data visualization. Upon completing this course, students are expected to be able to analyze spatial data, address geospatial challenges, and effectively present their results using advanced visualization techniques.

COURSE SYNOPSIS:

This course introduces geostatistics using ArcGIS in a geoscience context and will prepare students for more advanced geospatial and spatial statistics courses. Specifically, it introduces geospatial data collection, analysis, interpretation, and presentation, particularly for urban studies. Students will learn geospatial techniques including geographic information systems (GIS), remote sensing (RS), and global positioning systems (GPS). Students will apply novel geostatistical analysis (e.g., space-time analysis, spatial machine learning techniques) to address urban environmental problems of the contemporary world. This course equips students with practical and innovative geospatial techniques for their projects and future careers. It will mainly use ESRI's ArcGIS Pro software and include practical exercises during lectures, lab exercises, homework assignments, and class projects.

LECTURE TOPICS:

- Lecture 1 Geospatial techniques & geostatistics for urban studies
- Lecture 2 Descriptive spatial statistics
- Lecture 3 Inference spatial statistics
- Lecture 4 Point pattern analysis
- Lecture 5 Clustering analysis
- Lecture 6 Spatial autocorrelation
- Lecture 7 Spatial regression
- Lecture 8 Kriging interpolation
- Lecture 9 Space-Time analysis
- Lecture 10 Spatial machine learning
- Lecture 11 Interactive/3D visualization
- Lecture 12 Dynamic mapping

Labs

- Lab 1 Collection of geospatial data for urban studies
- Lab 2 Analysis of spatial patterns
- Lab 3 Identification of spatial relationships
- Lab 4 Interpolation of spatial data
- Lab 5 Analysis of temporal changes in spatial data
- Lab 6 Advanced visualization of data and results

RECOMMENDED READING LIST:

David O'Sullivan, David Unwin. Geographic Information Analysis, 2nd Edition. ISBN: 978-0-470-28857-3.
http://www.wiley.com/WileyCDA/WileyTitle/productCd-0470288574.html
Shellito, Bradley. 2023. 2nd Edition, Introduction to Geospatial Technologies. Macmillan, Paperback ISBN: 9781319498627.
https://www.macmillanlearning.com/ed/nz/product/Introduction-to-Geospatial-Technology--6th-edition/p/1319498620

	Course Learning Outcomes (CLOs) After completing this course, students would be able to:	**Alignment with Programme** Learning Outcomes (PLOs)*						**Course Assessment Methods**
		1	**2**	**3**	**4**	**5**	**6**	
1	Have a basic understanding of the nature and representation of geographic data and geospatial techniques for urban studies.	✔	✔	✔	✔	✔	✔	Exam
2	Gain solid knowledge about the geostatistical analysis, spatial autocorrelation, spatial regressions, and spatiotemporal analysis.	✔	✔		✔	✔		Lab exercise, Exam
3	Understand and apply different techniques of geostatistical interpolation, spatial pattern analysis, geospatial grouping analysis, and spatial machine learning.	✔	✔		✔	✔		Lab exercise, Exam
4	Be able to use ArcGIS pro to visualize spatial data in different formats (e.g., interactive web maps, 3D maps, and animation		✔	✔	✔		✔	Lab exercise

	maps).							
5	Create a compelling poster on a topic of the student's choice using the techniques learned in the course.				✔		✔	Individual project