

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 % |
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| • 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 |

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

*Geography Major Programme Learning Outcomes (PLOs)

In order to meet the demands and challenges in this dynamic and ever-changing world, the Department has designed a series of well-structured and contemporary courses to cater to the different interests of students. Its courses are designed to align with the University's educational aims which hope to nurture future generations not only with a critical and intellectual mindset, but also with a passion to contribute to society in general.

After completing the programme, Geography Major students should be able to:

PLO1 critically analyse the geographical aspects of the relationship between people and the natural environment;

PLO2 demonstrate and develop an understanding of how these relationships have changed with space and over time;

PLO3 identify, collect and utilize primary and secondary data to investigate and analyse the issues and problems facing people, places and society;

PLO4 integrate, evaluate and communicate information from a variety of geographical and other sources;

PLO5 participate in promoting social, economic and environmental sustainability at the local, regional and global scales; and

PLO6 effectively apply a range of transferable skills in academic, professional and social settings.