

Introduction to Geographic Information Systems and Spatial Analysis

Instructors

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Course Description

Geographic Information Systems (GIS) are a powerful computer-based tool for storing, visualizing, and analyzing spatial information together with non-spatial data. The main objective of this course is to introduce participants to basic concepts and methods of GIS and spatial data analysis. We will exemplify applications that touch upon various disciplines such as environmental monitoring, rural development, and agricultural economics. The course will further introduce students to map-making, spatial analysis, and spatial modeling. To accomplish these goals, we will provide a mix of lectures addressing the basic theoretical knowledge of GIS and spatial data analysis, presentations from external speakers with applications of spatial data analysis, and practical hand-on exercises using ESRI ArcGIS. Students are encouraged to use their own data sets for the exercises.

This course is **NOT** focused on software training, i.e., ArcGIS. The focus of the course is rather on the theoretical aspects, key concepts, spatial methodologies and potential applications of spatial data analysis.

Course Outline - Topics

Day 1: Introduction to GIS

- What is GIS?
- History of GIS
- Why GIS: applications, examples
- What's special about spatial data?
- Introduction to map projections.
- Introduction to ArcGIS
- Example of practical applications (external speakers)

Exercise 1: Basic ArcGIS applications

Day 2: Introduction to GIS data models

- Data models: Vector, Raster
- Vector data: Points, lines, polygons
- Raster data: Grids, images
- GIS data manipulations: Import/export, data conversion

Exercise 2: Creating, editing and managing spatial data using ArcGIS

Day 3: Thematic mapping and spatial analysis

- Thematic mapping: Elements of a map, creating a map
- Introduction to spatial data analysis and geoprocessing
- Vector data analysis: Spatial query, buffer, overlay
- Raster data analysis: Map algebra and raster calculator

Exercise 3: Spatial analysis and preparation of a thematic map

Day 4: Geostatistics and spatial econometrics

- Spatial data integration
- Spatial interpolation
- Exploratory spatial data analysis
- Spatial regression analysis

Exercise 4: Spatial statistical analysis

Day 5: Application examples and wrap-up

- Introduction to remote sensing and image analysis
- An application of spatial statistics
- Course summary
- Miscellaneous: Questions and answers
- Course evaluation

Exercise 5: Introduction of take-home project

Teaching methods

Lectures (~40%), practical exercises (~40%), external presentations (~20%)

Grading

- 20% active participation
- 30% exercises
- 50% homework. Participants shall write a short report containing thematic maps based on the results of the spatial data analysis. Participants are encouraged to use their own data and do spatial analysis using GIS as a tool to support their research.

Credit points

3

Necessary course materials

No designated textbook. Handouts will be made available during the class.

Software

ArcGIS 10, MS Office, GeoDa

Organization and time

The course is organized as a one-week (5 full days) block modules mixed with seminars from external speakers.

Time & Place

January 30- February 3, 2012, at IAMO, Halle (Saale)

Language

English