

# 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 GIS concepts and methods. We will exemplify GIS applications that touch upon various disciplines such as environmental monitoring, rural development, and agricultural economics. After finishing this course, students should have a general understanding of the components of GIS as well as its potential benefits and pitfalls. 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 analysis, presentations from external speakers of GIS research applications, and practical hand-on exercises using ESRI ArcGIS. Students are invited to use their own data sets for the exercises.

## Course Outline - Topics

- Introduction to GIS (day 1)
  - What is GIS?
  - History of GIS
  - Why GIS: applications, examples
  - What’s special about spatial data? Intro to map projections.
  - Introduction to ArcGIS
  - Example of practical applications (external speakers)
  - Exercise 1: basic ArcGIS applications

- GIS Data Introduction (Vector, Raster) (Day 2)
  - GIS Data models: Vector, Raster
  - The vector data model: points, lines, polygons
  - The raster model: Grid, Images;
  - Data acquisition: Map digitalization; GPS; Remote Sensing etc.
  - GIS data files: shapefile, GeoDatabase
  - Data Import/Export;
  - Data conversion;
  - Spatializing attribute tables;
  - Exercise 2: creating, editing and managing data using ArcMap and ArcCatalog
  
- Data editing, query and visualization. (Day 3)
  - Data editing;
  - Data Selection and queries;
  - Table joining;
  - What is a map? How to make a map?
  - Elements of a Map: titles, symbolization, scale bars, north arrows, legends;
  - Creating a map;
  - Advanced thematic mapping with graphs;
  - Brief intro to web mapping
  - Exercise 3: making a thematic map
  
- Spatial Analysis (Day 4)
  - Introduction to Spatial Analysis and geoprocessing;
  - Vector data analysis: spatial queries, buffer, overlay etc.
  - Grid algebra and calculator;
  - Exercise 4: Spatial analysis
  
- Advanced Spatial Analysis and Modeling (Day 5)
  - Spatial modeling;
  - Spatial statistics;
  - Exercise 5: starting of take-home project

### **Teaching methods**

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

### **Grading**

- 20% active participation;
- 30% daily exercises;
- 50% final report of take-home project. Participants will write a report, term paper or make series of maps based on a take-home GIS project. Participants are encouraged to use their own data and do spatial analysis using GIS as a tool to support their research.

### **Credit points**

3

**Pre-requirements**

Basic computer knowledge especially in Windows operating systems and MS office.

**Necessary course materials**

No designated text book. Handouts will be available during the class.

**Software**

ArcGIS 9.3, MS Office

**Organisation and time**

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

Time & Place: February 22- 26, 2010, at IAMO, Halle (Saale)

**Language**

English