GIS-Analysis and Modeling
The Program of the University Course for Master Students

Lections 34 academic hours
Laboratory GIS Projects 32 academic hours
Controlled Personal GIS Projects 68 academic hours

Minsk, 2009
Course Objectives

The overall goals of the course "GIS-Analysis and Modeling" are to:

- Promote understanding of the geographic information science and technology enterprise;
- Allow students to choose and apply appropriate methods for the GIS-analysis and modeling of the spatial data often encountered in applied geography;
- Allow students to formulate a research problem in a topic area of their own choosing, to gather and organize appropriate available datasets, and to understand how a variety of GIS-methods among those covered in the course can be applied in combination to thoroughly explore real questions.

The particular objectives of each chapter of the course text and associated GIS-projects are outlined below.

Chapter 1. Introduction in GIS-Analysis and Modeling

Main objectives of GIS-analysis and modeling. GIS software for GIS-analysis and modeling. Options and tools of vector and raster GIS-analyses. Spatial modeling in GIS.

Chapter 2. Creating a Geodatabase


GIS project: Building a geodatabase (ArcGIS).

Chapter 3. Vectorization in GIS

Convert raster data into vector-based feature in GIS. Understanding a raster dataset. Preparation a raster dataset to vectorization. Tracing raster cells (interactive vectorization). Batch vectorization.

GIS project: Conversion raster data into vector-based feature in GIS (ArcScan for ArcGIS).

Chapter 4. Editing Vector Features in GIS


GIS project: Methods of spatial adjustment in GIS (ArcGIS).

Chapter 5. Vector Analysis in GIS: the Basic

Elementary spatial analysis in GIS. Spatial statistics in GIS. Advanced spatial analysis in GIS. Network analysis in GIS.

GIS projects: Overlay analysis (ArcGIS), buffer analysis (ArcGIS), generalization (ArcGIS), creating a hydrological network dataset (ArcGIS).

Chapter 6. Working with Geodetic Data in GIS


GIS project: Survey Analyst and Cadastral Editor (Survey Analyst and Cadastral Editor for ArcGIS).

Chapter 7. Working with Temporal Data in GIS

Simple and complex temporal events. Symbolizing temporal data in GIS. Displaying temporal data in GIS. Working with real-time data.
GIS project: Adding, symbolizing and replaying temporal data in GIS. Applying actions (Tracking Analyst for ArcGIS).

**Chapter 8. Spatial GIS-Analysis**
*GIS projects:* Surface generation and surface analysis in GIS (Spatial Analyst for ArcGIS), mapping distance in GIS with straight line distance and cost weighted distance functions (Spatial Analyst for ArcGIS).

**Chapter 9. Geostatistical GIS-Analysis**
*GIS project:* Creating a surface with geostatistical techniques (Geostatistical Analyst for ArcGIS).

**Chapter 10. Hydrological Modeling in GIS**
Understanding drainage systems. Exploring DEM. Deriving runoff characteristics (flow direction, flow accumulation, stream order, flowlength, watersheds).
*GIS project:* Performing hydrological modeling in GIS (Spatial Analyst for ArcGIS).

**Chapter 11. 3D Modeling in GIS**
Creating 3D surface models. Displaying 3D surfaces. Analyzing 3D surfaces. 3D visualization. Animation. 3D symbology. 3D graphics and text.
*GIS project:* 3D modeling in GIS (3D Analyst for ArcGIS).

**Chapter 12. Geoprocessing in GIS**
*GIS project:* Geoprocessing in GIS (ArcGIS).

**Chapter 13. Mapmaking, Mapping and GIS-Design of Maps**
*GIS project:* Mapmaking in GIS (ArcGIS).
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Literature for Reading: