

Course Code

GE07

Course Name

Geographic Information Systems for Earth Sciences

Instructor

Dr. Mehmet Lütfi Süzen



Professional Career

Dr. Süzen is currently vice chairman of the Geological Engineering Department in Middle East Technical University. He graduated from same department at 1994, and he had his MSc degree on clay mineralogy at 1996 also from the same department. In 1997 he was granted to Netherlands Fellowship Programme and he spent one year at ITC (International Institute for Geo-Information Science and Earth Observation) excelling at Remote Sensing and Geographical Information Systems. He received his PhD degree at 2002 from Geological Engineering department of METU and he started his academic career there. He got Associate Professor Title at December 2006 on Remote Sensing and Geographic Information Systems (GIS).

Since 2002 Dr. Süzen had involved in many industrial projects both as a consultant or as a project manager, whereas he carried out many scientific projects funded by variety of organizations. He designed a number of tailor-made education programs for many different clients considering their needs about Remote Sensing and GIS. He is currently conducting numerous research and development projects and giving consultancy at METU Technopolis about remote sensing, GIS, geostatistics and Multicriteria decision analyses (MCDA) especially applied to environmental and earth related subjects.

Apart from his professional experience, he is teaching Remote Sensing and GIS courses in undergraduate and graduate level. He also supervised many MSc and PhD theses. He is awarded as Educator of the year in METU in 2004-2005 and in 2007- 2008 semesters and also awarded as the Young Researcher Success Award at 2007.

Course Objective and Description

The objective of the course is to introduce the philosophy, basic level spatial data manipulation and various applications of Geographical Information Systems (GIS) in earth sciences. The course will tend to train the participants to utilize GIS technology and its derivative products for handling the coordinate based data to achieve any spatial project goals. After this course participants are expected to have knowledge about:

- The concept of geo-spatial data
- The concept of geographical information systems
- Properties of spatial data, available models and their structures
- The practical information about map projections
- Transforming the data into different models
- The digital elevation model, its derivatives and potential uses
- Some implications about map operations and their possible thematic uses
- The concept of working with multiple maps to create some thematic maps
- Foundation information for modeling in a GIS

Who Should Attend

Earth scientists and engineers

Prerequisite

None

Learning Level

Graduate

Duration

5 days

Course Material

Hard copies of the power point presentations

Course Outline

Day One

- Introduction to GIS
 - o Definitions
 - o History of GIS
 - o Components of GIS
 - o Mapping concepts, features, and properties
 - o Map characteristics
 - o Map scale
 - o Scale in digital maps
 - o Map accuracy and error

Day Two

- Spatial Data Models (Raster – Vector)
 - o Real World vs Spatial model
 - o Spatial objects
 - o Types of spatial objects
 - o Raster models
 - o Vector models
 - o Attribute data
 - o Measurement scales
 - o Relational data model
- Spatial Data Structures (Raster – Vector)
 - o Raster structures
 - o Raster compression
 - o Vector structures
 - o Vector topology
 - o Rasterizing vector maps

Day Three

- Map Operations
 - o Data selection and retrieval
 - o Re-classification
 - o Measurement
 - o Overlay operations
 - o Map crossing
 - o Introductory map projections
 - o Coordinate systems
 - o Datums
 - o Projections
 - o Distortions
 - o Georeferencing and resampling

Day Four

- Spatial Transformation
 - o Continuous vs discrete fields
 - o Point density estimation
 - o Interpolation
 - o Contouring
- DEM Derivatives + Watershed Analysis
 - o DEM generation
 - o 1st and 2nd degree DEM derivatives and their generation
 - o Watershed analysis
 - o Visibility analysis

Day Five

- Tools for Map Analysis (single map)
 - o Operations on single maps
 - o Measurement, reclassification, data retrieval
- Tools for Map Analysis (Map pairs)
 - o Overlays
 - o Unique condition maps
 - o Unique polygon maps
 - o Examples used in decision support systems
- Accuracy and Precision
 - o Sources of error
 - o Accuracy vs precision
 - o Systematic and non systematic errors
 - o Error propagation in GIS
 - o Metadata and clearinghouse concept.

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