Theory and Applications of Geographic Information Systems and Science (GIS)

Course #: 001-2-6002

Instructor: Dr. Aviva Peeters

3 weekly hours, Graduate level, 3 credits

Description:

The course is an introduction to the concepts and application of geographic information systems and science (GIS). It is designed for students without former GIS experience, but students who have taken a course before can benefit from taking it. It focuses on the use of GIS for scientific inquiry and on its application for real-world problem solving. Different types of GIS spatial analysis are studied and applied such as suitability analysis, surface analysis and 3D analysis. Case studies from various environmental research domains are used as demonstrations. Each lesson comprises of a theoretical introduction and of an exercise. The exercises include training on the ArcGIS® Desktop software package.

Recommended reading: course exercise manual and recommended reading will be supplied by the instructor at the beginning of the semester.

Grading is based on home exercises and on a semester project. The project consists of designing and applying a GIS analysis model relevant to the student's field of interest.

Students are required to give an oral presentation and a final research paper based on their project. Both will be submitted at the end of the semester.

Grading:

Attendance -10%

Project's oral presentation – 20%

Project's research paper – 50%

Home exercises – 20%

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Lesson 1 *Monday Oct 15th*

- An introduction to GIS: history, theory, concepts, components and applications.

An introduction to the ArcGIS Desktop software package.

Lesson 2 *Monday Oct 22nd*

Building the GIS database part I

- Database design and structure.
- Data sources and data types.
- Acquiring data.
- Editing metadata.

Lesson 3 : *Monday Oct 29th*

Building the GIS database part II

- Coordinate systems.
- Georeferencing.
- Digitizing and editing data.

Lesson 4 : *Monday Nov 5th*

Spatial analysis: concepts, techniques and types.

- The Spatial Analyst extension.
- Querying, buffering and polygon overlay applied to a suitability analysis.

Monday Nov 12th- No Class

Lesson 5: *Monday Nov 19th*

GIS data models: raster, vector and TIN.

Lesson 6: *Monday Nov 26th*

Display, visualization and presentation (maps, graphs and reports).

Monday Dec 3rd-No Class

Lesson 7: *Monday Dec 10th*

Working with tables in ArcGIS and geolocating.

Lesson 8: *Monday Dec 17th*

Raster overlay applied to a suitability analysis.

Lesson 9: Monday Dec 24th

Working with 3D data:

- The 3D Analyst extension.
- Spatial interpolation applied to surface analysis and 3D analysis.

Lesson 10: *Monday Dec 31st*

A summary + Presentations