WRS - ITC. The Netherlands.

Introduction to Geographic Information System course

SESREMO Tempus Project.

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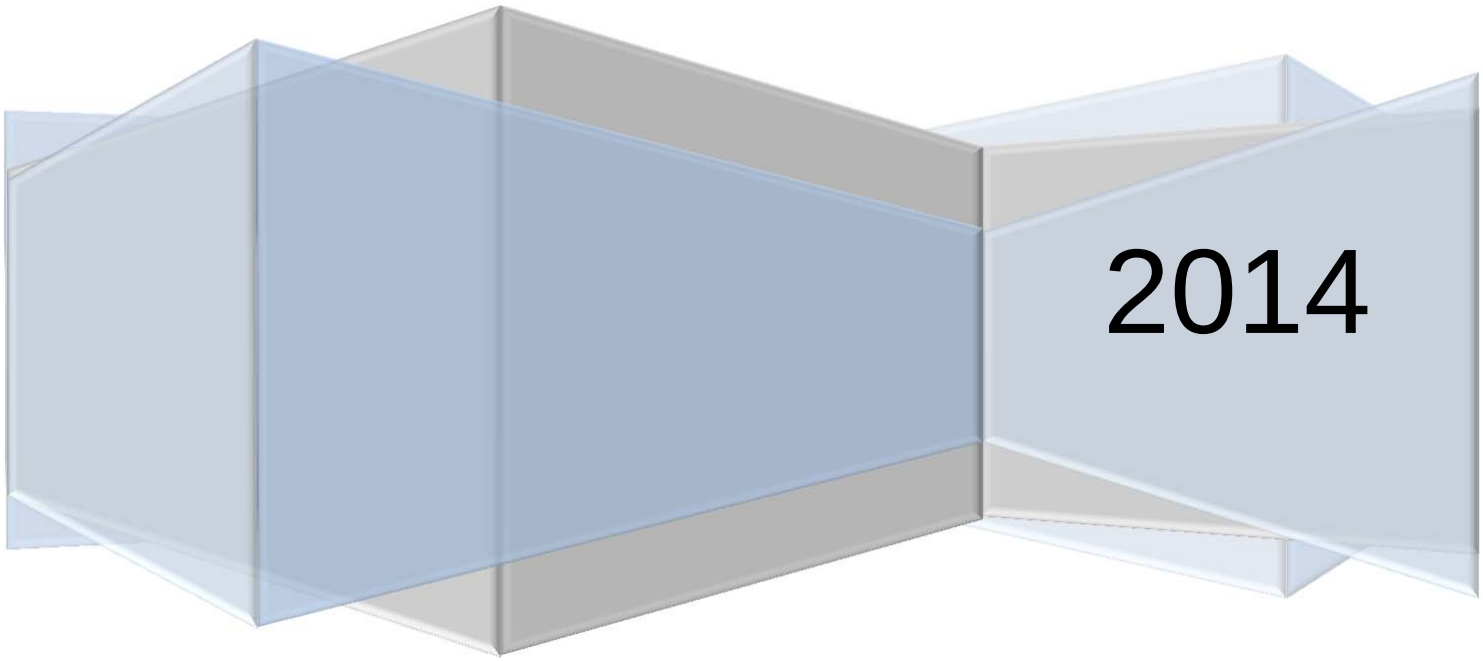
Curricula transfer



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Introduction to GIS course

This course is meant to an introductory course in elements of Remote Sensing with a 5 days duration and a load of 40 hours. This course corresponds to the SESREMO – Tempus initiative

Objective

Students learn the basics of GIS concepts. GIS concepts are software independent, but you need a software to experience the tools. ArcGIS is very extensive software to be introduced in one week. ILWIS will be used to get the grip in basic GIS tools. ILWIS is the same tool used in the Remote Sensing course. Databases will be discussed but the content is software specific. ILWIS does not have a complete database, but the elements in it allow the learning of the basics..

Course Material

Many training courses are on line. ESRI training: http://training.esri.com/gateway/index.cfm. Many free courses.

CPDGIS Course Curriculum:

Introduction to GIS	• What GIS is about? • The GIS data management processing system • The three spatial components of the GIS • Overview of applications and capabilities in hydrology
Spatial data types	• Fields and objects • Computer representations: tessellations and vector-based • Representation for continuous and discrete fields and objects

Data base management	• Databases and database management systems (DBMS)
	• DBMD functionality and architecture
	• The relational data model
	  o Relations, tuples and attributes
	  o Primary and foreign keys
	• Querying a relational database
	  o Data integrity
	  o Selection
	  o Attribute projection
	  o Joining
	• Linking spatial and attribute data

Georeferencing[1]	• Spatial referencing:
	  o Reference systems: geographical and Cartesian coordinates
	  o Ellipsoids and datum
	  o Datum transformations
	• Map projections: classification and properties
	  o UTM projection

Data acquisition, preparation and input and data preparation	• Data preparation
	  o Digitizing errors and vector cleaning operations (software related)
	• Interpolation methods from point data
	  o Discrete methods
	  ▪ Thiessen Polygon (nearest neighbor)
	  o Continuous : interpolation techniques
	  ▪ Trend surface fitting (linear, quadratic)
	  ▪ Moving window averages
	  ▪ Inverse distance weighing
	  ▪ Triangulation
	  ▪ Geostatistics

Spatial data Analysis	• Analytical models: description of analytical functions:
	  o Measurements
	  ▪ Vector measurements
	  ▪ Raster measurements
	  o Retrievals
	  ▪ Spatial Selection by Attribute conditions
	  ▪ Spatial Selection using topological relationships
	  o Classification
	  ▪ User controlled classification
	  ▪ Automatic classification
	  o Overlay functions: arithmetic, comparison and logical operators.
	  ▪ Vector overlay
	  ▪ Raster overlays

[1] This is also given in the CPDGIS

	• Decision tables o Neighborhood functions: functions
Data visualization and presentation	• Visualization process o Elements of…: functions, rules and conventions o Nature of the data: nominal, ordinal, interval and ratios o Basic representation elements: point, line and area symbols. Non geographical: text. o Visual variables: form/shape, orientation, color, texture, lightness and size. Examples. o The process of representation

Table 1: Tentative schedule for the Foundational Course in GIS SESREMO-Tempus.

Week 2	Course in Foundational GIS - SESREMO Tempus				
Period	05-Jan-15 Monday	06-Jan-15 Tuesday	07-Jan-15 Wednesday	08-Jan-15 Thursday	09-Jan-15 Friday
8:45-9:30 9:45-10:30	Gentle Introduction to GIS	GIS and data types	Data entry and data preparation (pre-processing)	Spatial data analysis	Interpolation
10:45-11:30 11:45-12:30	Coordinate systems and georeferencing	Database Management System	Data entry and data preparation (pre-processing)	Spatial data analysis	Data visualization
13:45-14:30 14:45-15:30	Spatial georeferencing	Tabular information and queries	Data entry methods and management	Spatial data analysis with vector and raster	Spatial data analysis with vector and raster
15:45-16:30 16:45-17:30	Spatial georeferencing	Tabular information and queries	Data entry methods and management	Spatial data analysis with vector and raster	Spatial data analysis with vector and raster

Alternatively and after discussion among the class members, the program can be changed to have one day of working in a private project.
Students could try to use the concepts learnt during the GIS and RS courses to solve a study case of their own. To that they should bring they own material and make it available in the GIS environment.

Table 2: Estimated number of hours for students and staff Note: 1 period = 2 hours

Summary of hours				
	Staff		Students	
	Hours	Periods	Hours	Periods
Lectures - L	0	0	20	10
Supervised Practicals - P			20	10
Individual Assignments - IA			0	0
Group assignment - GA			0	0
Self study unsupervised practicals - S			0	0
Overhead - O			0	0
Overall practicals	0	0	20	10
TOTALS	0	0	40	20

How to understand the material for SESREMO project

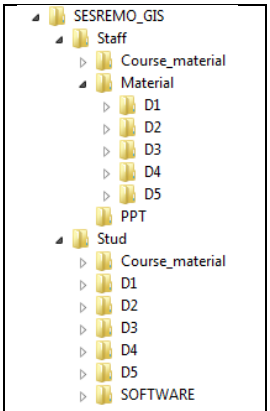

Figure 1: Folder structure of the material

- The material prepared for the SESREMO Tempus project for the GIS course is compiled digitally.
- All the material and software is free.
- It is expected that the students will do first this course and then the rest of the courses in the packages.
- For students without knowledge in ILWIS they should follow the “Introduction to ILWIS” practical prior to start this course
- The material is structured in hierarchical folders (see Figure 1):
    - The SESREMO_GIS folder contains this document, a spreadsheet that could be used to modify the schedule and a imscc file (see below later). The doc and the spreadsheet are linked. Any change in the spreadsheet schedule will reflect in the doc. It is advisable to explore this sheet to see its internal structure if it is of use.
    - The SESREMO_GIS contains 2 subfolders: “Staff” and “Stud” with all the lecture material required for this course. The students only need the “Stud” folder (with all subfolders) and the Staff the “Staff” folder (with all subfolders)
        - “Staff” subfolder: It contains 3 subfolders: “Course Material”, “Material” and “PPT”
            - “PPT”: are the powerpoint presentations for each lecture

        - "Course Material": It contains this document in form of PDF. There is a subfolder e-books with the text books of this course: Most relevant is the ITC text: GIS_book_ITC.pdf. This file is also give to students.
        - "Material": it is divided in subfolder D1, D2, …D5. One subfolder per day. The Dx has other two subfolders, "P" (stand for Practicals) and "T" (stands for theory).
            - "Tx": It is the theory of day "x". It is the same material as in the folder PPT organized by day.
            - "Px": It is the practical of day "x". It contains all the practicals: data and explanatory docs in word. There are two word versions: for staff and the student. The version for the staff has answers to questions. The version for the students is identical but answers were deleted. Students will get a PDF of this last doc.
    - "Stud" subfolder: It contains 7 subfolders: "Software", "Material" and 5 "D" folders one per day of the course.
        - "Software": Contains ILWIS 3.31 academic and the patch file required to free the software. Follow the instructions in the "ILWIS_install_readme.txt" file. ILWIS is a Windows base application.
        - "Course Material": It contains this document in form of PDF. There is a subfolder e-books with the text books of this course: Most relevant is the ITC text: GIS_book_ITC.pdf.
        - 5 "Dx" folders: This is the material for days 1 to 5. It contains 2 subfolders "Px" and "Tx".
            - "Tx": It is the theory of day "x". It comes in PDF format. Each file contains 4 or 2 slides per page, to facilitate printing. Staff could make it available in other PDF formats using the material in Staff/PPT.
            - "Px": It is the practical of day "x". It has one PDF self-explanatory file for the student to do the exercises and all the data in ILWIS or other formats to reproduce the exercise. The PDF file includes questions along the exercise that the student must solve and answer.
- Elearning (imscc file): The course is supported with elearning. The system selected to support this course is CANVAS INSTRUCTURE, but it can be supported by any other system able to import a SCORM file. A file gis-sesremo-export.imscc is available. It can be used to automatically build the elearning in CANVAS. Few extra settings are required. The file includes Syllabus, Quizzes and Schedules. Staff can build over these bases.