GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2017-2018

Land Information Systems (I000064)

Course size *(nominal values; actual values may depend on programme)*

Credits 5.0	**Study time 135 h**	**Contact hrs**	60.0 h

Course offerings and teaching methods in academic year 2017-2018

A (semester 2)	lecture	23.75 h
	seminar: practical PC room classes	30.0 h
	guided self-study	6.25 h

Lecturers in academic year 2017-2018

De Wulf, Robert	LA04	lecturer-in-charge
Lievens, Hans	LA04	co-lecturer
Sleutel, Steven	LA12	co-lecturer
Vancoillie, Frieke	LA04	co-lecturer

Offered in the following programmes in 2017-2018	crdts	offering
Bachelor of Science in Bioscience Engineering (main subject Land and Forest Management)	5	A
Master of Science in Bioscience Engineering: Environmental Technology	5	A

Teaching languages

Dutch

Keywords

Geografic information systems, digital data bases, spatial data analysis

Position of the course

This course consists of two parts: a basic module and a module with in-depth applications for land management. The basic mode is programmed during the first six weeks of the semester. From week 7 applications module starts.

GIS: basics (Lecturer: Frieke Vancoillie)

In this module the basic principles of digital geocoded information systems are treated. The full cycle of acquisition, management, processing, visualisation, integration and communication of geographic data is handled. The main functions applied for land management are reviewed. During the exercises (software ArcGIS) in the computer room, the students can acquire basic skills pertaining to GIS data analysis. The exercises are performed with free and open source software (FOSS), partly available on classroom PCs, partly installed on laptops brought on by the students themselves. The basic module ends with an introduction ArcGIS. During the basic module the students attend BeGEO: a comprehensive congress with exhibition about geo-information.

GIS: applications (Lecturers: Frieke Vancoillie, Steven Sleutel and Hans Lievens)

This module focuses on the use of geographic information systems for vegetation, soil and water management. Where possible, guest speakers are invited to explain the role of GIS analysis for operational applications. Moreover, a company visit to the Agency of Information Flanders is organized.

Contents

GIS: basics

The following aspects are addressed systematically: GIS concepts, geospatial data structures, data input, data display, data query, data analysis and data output. The exercises are tasks that are independently performed with QGIS. As the course progresses, the complexity of the exercises increases. The treated geospatial problems

are taken from real life: e.g. missing maps, volumetric assessment of the Antarctic icecap, emergency planning in case of nuclear plant failure, suitability analysis for the installation of solar panels.

GIS: applications

Part 1: vegetation management

The three major themes of this part are: 1) landscape analysis, 2) habitat suitability analysis, and 3) species distribution modeling. These three themes are approached in both theoretical and practical way. In theory, discuss the basic concepts and key developments and techniques within the central theme. Subsequently, the acquired knowledge is used in a practical context. The practical exercises aim at analysing various environmental problems and developing creative solution strategies. The exercises are conducted in QGIS, ArcGIS, GIS SAGA, Frag Stats et al. When available, a professional guest speaker is invited for a lecture/demonstration/workshop.

Part 2: soil management

Within this part, specific attention is given to existing soil databases, the structure of a soil information system, spatial variation of soil properties and related consequences for soil management. Two themes are addressed: 1) soil variability (factors and causes; relation to spatial extent; introduction to spatial interpolation), and 2) datasets with relevance to soil management (Belgian Digital Soil Map, Subsoil Flanders Database, et al.; practical applications and limitations). The theory explained in the lectures is illustrated in several PC practical exercises using ArcGIS.

Part 3: water management

This part focuses on two main topics: 1) an overview of GIS data sets that are available for hydrologic applications, and 2) the use of digital elevation models for the derivation of hydrologic information, including the calculation of stream directions, and the delineation of watersheds and river networks. The concepts of these two subjects are discussed from a theoretical point of view, and subsequently applied during exercises which are carried out using the ArcGIS software.

Initial competences

Basic knowledge of informatics

Final competences

1 Identify the function of the different components of a GIS
2 Identify the properties of a geographic data model (including scale, projection, coordinate system, etc.) and use these properly
3 Distinguish the characteristics of raster and vector data and integrate these into applications
4 Identify the basic principles of relational databases and link them with a GIS
5 Retrieval of relevant spatial data for a particular task
6 Critically analyse a spatial problem and solve it independently
7 Design of cartographic information based on a GIS and spatial data
8 Select and use available hardware, software and expertise purposefully
9 Creatively exploit knowledge related to GIS concepts in spatial analysis and modeling assignments
10 Writing a high-quality scientific report with respect to a spatial analysis
11 Apply these insights and skills for applications related to vegetation, soil and water management

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Guided self-study, lecture, seminar: practical PC room classes

Extra information on the teaching methods

The theoretical lessons are lectures. The practical exercises are mainly supervised practicals and seminars in a PC-class.

Learning materials and price

GIS: basics

1) Course books (facultative):

- Longley, P., Goodchild, M., Maguire, D. & Rhind, D., 2011, Geographic Information Systems and Science (Chichester: Wiley)
- Burrough, P.A. and McDonnell, R.A., Principles of Geographical Information Systems (Oxford: Oxford University Press)

2) Slides + documents downloadable from Minerva

GIS: applications

1) Syllabi available
2) Slides + documents downloadable from Minerva

References

Through Minerva

Course content-related study coaching

Ad hoc after the lessons or during practicals; through Minerva

Evaluation methods

end-of-term evaluation and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Written examination with open questions, open book examination, participation

Examination methods in case of periodic evaluation during the second examination period

Written examination with open questions, open book examination, participation

Examination methods in case of permanent evaluation

Participation, job performance assessment, report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible

Extra information on the examination methods

• Theory (basics and applications): written examination with open questions: knowledge and insight
• Practicals (basics and applications): reports + open book practical examination

Calculation of the examination mark

• Theory (basics and applications): period bound (30%)
• Practicals (basics and applications): non-period bound (20%) and period bound (50%)
Abstaining from period aligned and/or non-period aligned evaluations gives rise to a total score (theory + practical exercises) of maximum 9/20, irrespective of the points for the different sections.