lgeo1343
2020

Earth observation by satellite

UCLouvain

Due to the COVID-19 crisis, the information below is subject to change, in particular that concerning the teaching mode (presential, distance or in a comodal or hybrid format).

5 credits	30.0 h + 30.0 h	Q1

Teacher(s)	Lambin Eric ;
Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	*The prerequisite(s) for this Teaching Unit (Unité d'enseignement – UE) for the programmes/courses that offer this Teaching Unit are specified at the end of this sheet.*
Main themes	Prerequisites : Notions of statistics, general physics course. The course has three components: 1: The presentation during lectures of the theoretical and methodological bases of remote sensing; 2: The application of image processing and interpretation methods to Landsat data on a region of Belgium, using image processing software on PC; 3: The exploration of a large range of remote sensing applications and of the methods used in each application, on the basis of CD-ROMs demonstrating case studies. Physical bases of remote sensing: - Definitions: radiant energy, radiant flux, radiant flux density, radiance; - Interactions between energy and the surface of the earth: laws of Stefan-Boltzmann and Wien. - Spectral reflectance curves ; - Atmospheric effects; - Physical interactions with thermal infra-red energy. The sensors used in remote sensing: - Landsat MSS and TM, SPOT; - AVHRR, Vegetation, MODIS; - the new high spatial resolution sensors. Image processing: - Corrections for non-systematic and systematic geometric distortions - Radiometric corrections - Extraction of statistics from images - Contrast enhancement - Spatial filtering - Supervised classification - Unsupervised classification - Classification errors estimation - Change detection methods - Multispectral transformations: Tasseled cap transformation; principal components analysis; - Notions of microwave remote sensing. Practical work: Processing of a Landsat TM image of Belgium: 1st session Introduction to image processing software 2nd session Color composites and contrast enhancement 3rd session Design of a scientific project 4th and 5th sessions Geometric correction 6th session Unsupervised classification 7th session Supervised classification 8th session Accuracy assessment of classification
Aims	1 Knowledge : The students will acquire a good knowledge of the different applications of remote sensing, and a capacity to decide which sensors and which image processing and interpretation methods are most appropriate for a given application. Skills : The students will gain understanding of the bases of remote sensing and will be able to process and interpret satellite data on a given region, using a image processing software on PC. Emphasis is put on optical remote sensing for terrestrial ecosystem applications. - - - - *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Evaluation methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** Continuous evaluation based on: • Two tests during the trimester: (i) physical basis of teledetection and (ii) image processing technique (10% of final result for each test, so 20% for both); • two practical work reports for each processing step (30% of final result for the overall of reports); • a work on teledetection applications: answer to several questions, based on CD-ROMs (20% of final result). Final evaluation: based on written examination (30% of final result).
Bibliography	• Richards J. 1986. remote Sensing Digital Image Analysis, Springer-Verlag, 2ème édition
Faculty or entity in charge	GEOG

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Biology of Organisms and Ecology	BOE2M	5		🔍
Interdisciplinary Advanced Master in Science and Management of the Environment and Sustainable Development	ENVI2MC	5		🔍
Minor in Geography	MINGEOG	5		🔍
Bachelor in Geography : General	GEOG1BA	5	LMAT1101 AND LMAT1102 AND LPHY1101 AND LPHY1102 AND LBIO1110 AND LBIO1117 AND LBIO1283 AND LBIR1271 AND LGEO1241	🔍
Master [120] in Population and Development Studies	SPED2M	5		🔍
Master [120] in Physics	PHYS2M	5		🔍
Master [120] in History of Art and Archaeology : General	ARKE2M	5		🔍
Master [120] in Environmental Science and Management	ENVI2M	5		🔍