UCLouvain

lgeo1343

2024

Earth observation by satellite

5.00 credits	30.0 h + 30.0 h	Q1

Teacher(s)	Lambin Eric ;Rousseau Raphaël (compensates Lambin Eric) ;
Language :	French
Place of the course	Louvain-la-Neuve
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
Learning outcomes	**At the end of this learning unit, the student is able to :** 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.
Bibliography	Le cours est principalement basé sur les deux références suivantes (des exemplaires sont disponibles en prêt à la Bibliothèque des sciences et technologie, BST). Les autres sources sont renseignées dans les slides du cours. • Campbell J. B., Wynne R. H. et Thomas V. A. (2023). Introduction to remote sensing. *Gulford*, 6ème edition, 634 pages ISBN 978-1462549405. • Richards J. et Jia X. (2013). Remote Sensing Digital Image Analysis, *Springer-Verlag*, 5ème édition, 494 pages. ISBN 3-540-64860-7
Faculty or entity in charge	GEOG

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Biology of Organisms and Ecology	BOE2M	5		
Master [120] in Environmental Science and Management	ENVI2M	5		
Interdisciplinary Advanced Master in Science and Management of the Environment and Sustainable Development	ENVI2MC	5		
Master [120] in Population and Development Studies	SPED2M	5		
Minor in Geography	MINGEOG	5		
Master [120] in Physics	PHYS2M	5		
Bachelor in Geography : General	GEOG1BA	5		