UCLouvain

lphys2162

2019

Introduction to the physics of the climate system and its modelling

In view of the health context linked to the spread of the coronavirus, the methods of organisation and evaluation of the learning units could be adapted in different situations; these possible new methods have been - or will be - communicated by the teachers to the students.

5 credits	22.5 h + 22.5 h	Q1

Teacher(s)	Goosse Hugues ;van Ypersele de Strihou Jean-Pascal ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	Description of the climate system and its components ; energy balance, hydrological cycle and carbon cycle ; key feedback mechanisms and climate sensitivity to external perturbation ; natural variability of climate at all time scales ; hierarchy of models of the climate system ; greenhouse effect and climate change induced by human activities.
Aims	**a. Contribution of the teaching unit to the learning outcomes of the programme (PHYS2M and PHYS1M)** A1.1, A.1.2, A1.5 A2.3, A2.5 A3.3 A4.1, A4.2 A5.1, A5.4 A6.1, A6.2, A6.3, A6.5 A7.2, A7.3, A7.4, A7.5, A7.6 1 A8.1 **b. Specific learning outcomes of the teaching unit** At the end of this teaching unit, the student will be able to : 1. describe the main interactions between the components of the climate system ; 2. develop a simple model of the climate system ; 3. simulate the behavior of the climate system at various time scales ; 4. choose the appropriate model according to the climatic problem ; 5. estimate the uncertainties of observations and climate models ; 6. assess the relevance of a climate theory based on available information ; 7. structure the results of a model of a complex system. - - - - *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.** Written exam: short development. Individual oral examination based on a group project. Project report.
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** Lectures. Integrative project. Computer simulation sessions. Online exercises. List of articles to read.
Content	1. Description of the climate system and its components 2. Energy balance, water cycle and carbon cycle 3. Modelling of the climate system 4. Response of the climate system to a perturbation 5. Brief history of climate: causes and mechanisms 6. Future climate change

Bibliography	Goosse H., 2015, Climate System Dynamics and Modelling, Cambridge University Press, (ISBN-13: 9781107445833), 358 pages.
Faculty or entity in charge	PHYS

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Aims
Additionnal module in Physics	LPHYS100P	5		
Master [60] in Physics	PHYS2M1	5		
Master [120] in Forests and Natural Areas Engineering	BIRF2M	5		
Master [120] in Chemistry and Bioindustries	BIRC2M	5		
Master [120] in Agricultural Bioengineering	BIRA2M	5		
Master [60] in Environmental Science and Management	ENVI2M1	5		
Master [120] in Ethics	ETHI2M	5		
Master [120] in Philosophy	FILO2M	5		
Interdisciplinary Advanced Master in Science and Management of the Environment and Sustainable Development	ENVI2MC	5		
Master [120] in Geography : Climatology	CLIM2M	5		
Master [120] in Environmental Science and Management	ENVI2M	5		
Master [120] in Physics	PHYS2M	5		
Master [120] in Geography : General	GEOG2M	5		
Master [120] in Environmental Bioengineering	BIRE2M	5		