UCLouvain

lphys2162

2023

Introduction to the physics of the climate system and its modelling

5.00 credits	22.5 h + 22.5 h	Q1

Teacher(s)	Goosse Hugues ;Ragone Francesco ;
Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Prerequisites	LPHYS1213 for the students enrolled in the Bachelor in physics who wish to follow this teaching unit within the additional module in physics.
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.
Learning outcomes	**At the end of this learning unit, the student is able to :** **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.
Evaluation methods	Written exam: short development. Individual oral examination based on a group project. Project report.
Teaching methods	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	Learning outcomes
Additionnal module in Physics	APPHYS	5		
Master [120] in Geography : Climatology	CLIM2M	5		
Master [60] in Physics	PHYS2M1	5		
Master [120] in Environmental Science and Management	ENVI2M	5		
Master [120] in Environmental Bioengineering	BIRE2M	5		
Interdisciplinary Advanced Master in Science and Management of the Environment and Sustainable Development	ENVI2MC	5		
Master [120] in Chemistry and Bioindustries	BIRC2M	5		
Master [120] in Physics	PHYS2M	5		
Master [120] in Geography : General	GEOG2M	5		
Master [120] in Agricultural Bioengineering	BIRA2M	5		