


5 credits

45.0 h + 22.5 h

Q1

Teacher(s)	Deleersnijder Eric ;Legat Vincent ;
Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	LPHY1251, LMAT1261, LPHY1211 <i>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.</i>
Main themes	This course aims to enable an understanding of the basic principles of fluid mechanics (kinematics; balance of mass, momentum and energy) and an understanding of the main flow regimes, that is compressible, incompressible and geophysical flows.
Aims	<p>a. Course contribution to the LO reference framework (programme LO) LO1: 1.1, 1.4, 1.5 LO2: 2.3, 2.4 LO3: 3.5. LO6: 6.3.</p> <p>b. Specific formulation of programme LOs for this course At the end of this course, the student will be able:</p> <ol style="list-style-type: none"> 1. Study the budget of physical quantities on material volumes or on fixed control volumes 2. To identify the appropriate mathematical models for specific flows 3. To understand the difference between physical principles and phenomenological laws 4. To solve simple fluid mechanics problems 5. To evaluate the reliability and coherence of mathematical models 6. To apply dimensional analysis 7. To design simple apparatus for heat or mass transfer 8. To estimate the drag and lift of simple objects in a flow 9. To calculate the orders of magnitude relevant to a mathematical model 10. To grasp the main processes at work in geophysical flows <p>----- <i>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".</i></p>
Evaluation methods	Written exam with problem-based learning allowing the students to adopt a reflective approach to their learning and practices associated with it. Continuous assessment: presentation of MATLAB programmes for solving simple problems.
Teaching methods	Lectures with mini learning activities of discovery. Exercise sessions with problems to solve. Short homework assignments where the students implement numerical solutions to simple problems in MATLAB.
Content	Basic principles: continuum mechanics, Lagrangian and Eulerian descriptions, mass balance, momentum balance, energy and entropy balance, non-inertial reference frame, dynamic similitude. Ideal flows: dimensionless parameters, acoustic waves, compressible flows, shock waves, non-linear waves Incompressible, viscous flows: Boussinesq approximation, energy method, 1D flows, lubrication, boundary layers, introduction to turbulence. Geophysical flows: geohydrodynamic equations, dimensionless parameters, inertia oscillations, Ekman layer, geostrophic approximation, shallow water equations, Poincaré and Kelvin waves
Bibliography	Slides, notes de cours et énoncés des exercices déposés sur le site Moodle du cours.
Faculty or entity in charge	PHYS

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Aims
Bachelor in Physics	PHYS1BA	5	LPHY1251 AND LPHYS1202	
Minor in Physics	LPHYS100I	5		