UCLouvain

lgciv2056

2018

Marine Hydrodynamics

5 credits	30.0 h + 15.0 h	Q1

Teacher(s)	Deleersnijder Eric ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	An introduction to the dynamics of flows and reactive transport processes taking place in the marine environment, with a focus on regional scales (estuaries, coastal regions and shelf seas) and the possible links with coastal and maritime engineering, as well as water pollution control.
Aims	Contribution to the acquisition and evaluation of the following learning outcomes of the programme in civil engineering: • AA1.2, AA1.3 • AA3.1, AA3.2 • AA5.2, AA5.3 1 The student will be able to: • comprehend the key processes governing flows and related reactive transport processes in the marine environment, especially at regional scales; • deal with the equations representing the aforementioned phenomena; • assess a numerical modelling package aimed at simulating flows and reactive transport processes in the abovementioned domains of interest; • start engaging with coastal and maritime engineers, as well as officials in charge seawater pollution control. - - - - *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	Continuous assessment of knowledge through homework(s) and/or project(s), and a written exam.
Teaching methods	Classroom lectures and practical sessions, and self-learning through homework(s) or project(s).
Content	The following topics are dealt with: • quick introduction to or refresher of continuum mechanics; • reactive transport and continuity equations; • equation of fluid mechanics in a non-inertial reference frame and their application to marine hydrodynamics; • thin layer approximation, hydrostatic approximation, Boussinesq approximation, geostrophic equilibrium; • impact of Earth's rotation; • reduced-dimension models, with a focus on water column and depth-integrated models and their applications; • impact of stratification; • notions of turbulence closure schemes; • notions of numerical methods to solve the abovementioned equations; • model results diagnoses and skill assessment • case studies (selected in agreement with the students' areas of interest).
Inline resources	Slides, list of problems and computer animations available on or through Moodle (https://moodleucl.uclouvain.be/?lang=en).
Bibliography	• Slides and computer animations available on Moodle. Consulter les ouvrages suivants est conseillé (mais non obligatoire): • Burchard H., 2002, Applied Turbulence Modelling in Marine Waters, Springer • Cushman-Roisin B. and J.-M. Beckers, 2011 (2nd ed.), Introduction to Geophysical Fluid Dynamics - Physical and Numerical Aspects, Academic Press • Dyer K.R., 1997 (2nd ed.), Estuaries - A Physical Introduction, Wiley • Fisher H.B. et al., 1979, Mixing in Inland and Coastal Waters, Academic Press • Zheng C. and G.D. Bennett, 2002 (2nd ed.), Applied Contaminant Transport Modeling, Wiley

Faculty or entity in charge	GC

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Civil Engineering	GCE2M	5		🔍
Master [120] in Architecture and Engineering	ARCH2M	5		🔍