UCL Université catholique de Louvain

LAUCE1152

2013-2014

Hydraulic

5.0 credits	30.0 h + 30.0 h	2q

Teacher(s) :	Soares Frazao Sandra ; Deleersnijder Eric ; Zech Yves ;
Language :	Français
Place of the course	Louvain-la-Neuve
Main themes :	- Hydrostatics - Basic equations and flow models - Orifices et weirs - Pressure pipes
Aims :	- Initiation to hydraulics fundaments from continuous mediums mechanics - Theoretical and practical approaches of major problems of pressure flows pipes *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".*
Content :	- Introduction : domains of involvement of hydraulics, liquid properties, fundamental theorem about pressure (2 hours); - Hydrostatics (4 hours) : * Differential and integral equations, * Manometers, * Force component and centre of pressure on plane areas and curved surfaces, * Statics and dynamics of submerged and floating bodies; - Basic equations of hydraulics (2 hours) : Lagrangian et Eulerian approaches, displacement, deformation and rotation; - Flow model : * Perfect-liquid model (5 hours) : kinématics of irrotational flows : streamlines and potential, complex potential, conformal transformations; applications to bridge piers in rivers, to weirs and to hydrodynamic profiles, dynamics : Euler's equations, integral forms of Lagrange and Bernoulli; * Viscous-liquid model (2 hours) : Stokes assumption and Navier-Stokes equations, laminar in pipes : velocity parabolic distribution and discharge integral (Poiseuille); * Turbulent-liquid model (8 hours) : turbulence : statistical approach, Reynolds analogy, Navier-Stokes-Reynolds-Boussinesq equations, mixing length (Prandtl) velocity logarithmic distribution (smooth and rough turbulent cases), head losses : dynamic similitude, friction losses in pipes (Darcy, Moody-Nikuradse), eddy losses; * Application field of the models and selection of modelling assumptions - Applications * Liquid-wall interactions (2 hours) Hydrodynamic forces, Boundary layer; * Orifices et weirs (2 hours) * Closed conduits and pipe networks : steady flow (3 hours) : simple pipes; branching pipes; networks of pipes : mesh method (Hardy-Cross).
Other infos :	- Prerequisite: "Mechanics of the continuous mediums" - Pedagogy : courses, elementary exercises, lab on pipe flow - Evaluation : written examination (exercises), oral examination (theory)
Cycle and year of study :	> Bachelor in Engineering : Architecture > Bachelor in Engineering
Faculty or entity in charge:	GC