Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website www-csc.utt.fr)

Supervisor's name : Prof Abdellatif OUAHSINE Given names :

Status (prof., assistant prof., …) : Professor

Laboratory :	Laboratoire Roberval	Website address : https://roberval.utc.fr/
Institution :	Compiegne University of Technology, UTC	Website address : http://www.utc.fr/

Scientific competence of the supervisor:

Computational Fluid Dynamics (CFD), Modelling of fluid-structure interaction, Ocean waves Modelling, Computational ship hydrodynamics in confined waterways

Two major publications in the field proposed for the PhD :

1. Kaidi S., Rouainia M., Ouahsine A. (2012), 'Stability of breakwaters under hydrodynamic loading using a coupled DDA/FEM approach. Ocean Engineering, Vol.55, 2012, p. 62–70.
2. Souli M., Ouahsine A., Lewin L., (2000). 'ALE formulation for Fluid-Structure Interaction problems.' Journal of Computer Meth. in Appl. Mech. and Eng. 190 /5-7 pp 659-675

Website address of the personal page :

Supervisor's email : ouahsine@utc.fr

Description of the research work proposed for a PhD ***Topic # (see list) :*** VI-3.

Title : Development of a coupling strategy between Discrete Elements Methods (DEM) and Finite Element Method (FEM) for environmental Fluid-structure interaction problems : Application to Wave impacts and breakwater

Subject :

The main goal of this proposal is to set up a 3D numerical tool to deal with coupled problems of fluid-structure interaction to study the wave impacts and breakwater stability. The breakwaters are used for the protection of harbours and beaches against wave actions. However their design is traditionally based on empirical approaches which do not take into account important factors such as nonlinear wave-structure interaction, the contact forces between blocks, the shape of the breakwater system, etc.
This PhD research focuses on the analysis of the stability of breakwater under wave impacts by coupling the Computational Fluid Dynamics (CFD) and the Discontinuous Deformation Analysis (DDA) methods. (i) First, we plan to built a coupled Fluid-Porous model to describe the flow in the rubble mound foundation and rear structures by coupling the Reynolds Averaged Navier Stokes (RANS) model with a porous medium model. (ii) Second we construct a weakly coupled Fluid-Structucre model to simulate the movement of the breakwater and the blocks that constitute it, by coupling the previous Fluid-Porous model with a Solid model, based on Discret Elements Method (DEM). Discontinuous Deformation Analysis (DDA) is expected to be used as a DEM method, since is makes it possible to determine the displacements of any type of regular or irregular blocs shape without meshing procedure of blocks.

Keywords :

Computational Fluid Dynamic (CFD), Fluid-Structure Interaction (FSI), Finite Element Method (FEM), Discrete Element Method (DEM), Hydrodynamics, Coupling, Free surface, Breackwater stability

Expected collaborations :

Institute for Hydraulic Engineering and Water Resources,Technische Universität Braunschweig, Brunswick, Germany.
Laboratoire des sciences de l'ingénieur, de l'informatique et de l'imagerie, ICube UMR 7357-Strasboug University, France

Background required from the applicant :

Applied mathematics, Computational Fluid Dynamic.

Existence of a PDF file detailing the proposal ("yes" or "no") : Yes

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