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 : BRANCHERIE Given names : Delphine

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

Laboratory : Laboratoire Roberval, FRE CNRS 2012 Website address :

Institution : Université de Technologie de Compiègne Website address :

Scientific competence of the supervisor:

Supervision of the thesis will be insured by a team consisting of 2 HDRs (D. Brancherie professor at UTC and H. Smaoui, senior reseacher at Cerema EMF). This team brings together recognized skills in numerical modelling and scientific computing for fluid mechanics, porous media, hydro-sedimentary transport, solid mechanics and damage and rupture mechanics.

Two major publications in the field proposed for the PhD :

1. D. Brancherie and A. Ibrahimbegovic 2009: Novel anisotropic continuum-discrete damage model capable of representing localized failure of massive structures. part I. Engineering Computations, 26(1-2):100–127.
2. H. Smaoui, A. Ouahsine, D. P ham Van Bang, P. Sergent, F. Hissel, 2011: Numerical modelling of the sediment re-suspension induced by boat traffic. In Sediment Transport. pp 55-70, InTech, Vienna, Austria.

Website address of the personal page :

Supervisor's email : delphine.brancherie@utc.fr

Description of the research work proposed for a PhD ***Topic # (see list) :*** IV-6

Title : Strategy for numerical modelling of bank erosion due to river traffic

Subject :

The intensification of river traffic on some waterways causes the deterioration of the banks of these rivers. It raises the question of their long-term protection by limiting recourse to artificial and costly solutions for their protection. To our knowledge, few studies have been conducted on riverbank erosion induced by river traffic. Currently, approaches based on simplified analytical formulations are preferred, but they are not satisfactorily accounting for the complexity of the physical phenomena involved. The phenomena to consider are the combination of several multi-physics processes involving the flow of fluids under the effect of the passage of a boat but also of its interaction with the porous material of the bank.
The bank can be seen as a porous medium subjected to a variable load corresponding to the hydrodynamic flow induced by the passage of the boats. Under the effect of this load, the level of saturation of the bank evolves, possibly inducing local overloads of the solid skeleton of the bank leading to the gradual degradation of the bank.
The objective of the thesis is to propose a numerical tool to predict the evolution of the state of the bank and its possible rupture under the effect of the fluctuating fluvial flow associated with the passages of boats. (for more details, please see the attached pdf file)

Keywords :

Damage, porous media, solids mechanics, numerical modelling, bank erosion, river flow, rupture mechanics.

Expected collaborations :

The PhD candidate will collaborate with CEREMA (The Center for Studies and Expertise on Risks, the Environment, Mobility and Development). CEREMA is a public institution under the joint supervision of the French Minister of Ecological and Social Transition, and the Minister of territorial cohesion.

Background required from the applicant :

The applicant should hold an M2 in Mechanical Engineering (solid or fluid) or Applied Mathematics and skilled in the following area:
- Numerical modelling;
- Finite Element (or Volume) Method;
- Environmental flows and Code programming (Fortran90, C, C++).

Existence of a PDF file detailing the proposal ("yes" or "no") : Yes
(see guidelines on the website www-csc.utt.fr)