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 : Chazallon   Given names : Cyrille

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

Laboratory : ICUBE - GC-E

Website address : https://icube.unistra.fr/en/

Institution : INSA Strasbourg

Website address : https://www.insa-strasbourg.fr/en/

Scientific competence of the supervisor:

Mechanical behaviour of granular materials (modelling and testing) from soils to unbound granular materials for roads / Fatigue damage of asphalt concrete materials / Reinforced asphalt concrete materials (modelling and testing) / Rheological behaviour of bitumen mixes (modelling and testing) / Pavement modelling, civil engineering structures modelling / permeability tests of porous asphalt

Two major publications in the field proposed for the PhD :

1. G. Koval, J.-N. Roux, A Corfdir and F. Chevoir (2009). Annular shear of cohesionless granular materials: From the inertial to quasistatic regime. Physical Review E, v. 79, p. 021306. DOI: 10.1103/PhysRevE.79.021306.

2. K. Kamrin and G. Koval (2014). Effect of particle surface friction on nonlocal constitutive behavior of flowing granular media. Computational Particle Mechanics, v. 1, p.p. 169–176. DOI: 10.1007/s40571-014-0018-3.

Website address of the personal page :

Supervisor's email : cyrille.chazallon@insa-strasbourg.fr

Description of the research work proposed for a PhD   *Topic # (see list) :* IV-12

Title : Modelling water flow and sediment transport in porous asphalt by DEM/CFD coupling

Subject :

In recent years, cities worldwide have faced an escalating risk of pluvial flooding and its repercussions, primarily due to climate change-induced extreme precipitation events and urbanization. Porous Asphalt (PA) pavements offer a promising solution. They efficiently manage stormwater runoff, mitigating flood risk while being cost-effective and eco-friendly. Clogging, caused by void blockages and pollution accumulation, undermines drainage capacity, posing a significant challenge. Objectives of the proposed subject:

• Develop a numerical model to simulate water flow (computation fluid dynamics - CFD) through permeable pavements coupled to discrete element modelling (DEM) to describe the granular material structure and sediments.
• Incorporate factors influencing clogging, including sediment transport and pollutant accumulation and their effect on structure permeability.
• Investigate the impact of different pavement materials and designs on clogging susceptibility.
• Validate the model using experimental data from literature.

Keywords :

asphalt concrete, permeability, DEM, CFD, pavements,

Expected collaborations :

TU Braunschweig

Background required from the applicant :

During the PhD work the student will acquire deep experience in multiphysics simulations like multi-particle modeling and fluid dynamics. Computational competences will be developed (notably in Python). The proposed work will be also an opportunity to deal with high level pavement engineering.
We are looking for applicants interested on the study of materials and structures. Computer skills and previous experiences in one (or more) of the mentioned fields are welcome, but not mandatory.

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

(see guidelines on the website www-csc.utt.fr)