

Labex MEC “Mechanics And Complexity”

Post-Doctoral position offer

Duration: 1 year

Period: 1/09/2019– 31/08/2020, earlier start possible

Location: IUSTI/LMA Marseille, France

Gross salary: from 2423 € to 2843 €/month
depending on qualification and experience

Research project and job description

Title: Variational approach and homogenisation for dispersive waves in solids

Summary:

This post-doc position is dedicated to the study of dispersive waves propagation. Dispersive shock waves and solitary waves are typical solutions of dispersive models. These waves appear in various applications such as quantum systems (ultra-cold atoms, semi-conductors, electron beams, nonlinear photonics, collision-less shocks in plasmas), hydrodynamics (surface waves) and in solid mechanics (phononic crystals, micro-structured materials). During this post-doc, only dispersive waves in solid mechanics will be investigated. These waves appear in isotropic materials as soon as geometrical effects are taken into account. The simplest example is bending waves in a bounded bar. Another example is the propagation of waves in a 1D multi-layered medium, for which dynamic homogenisation predicts a classical wave equation (second order derivative in space and time) but also dispersive terms with fourth order derivatives in space and time. In the 1D linear case, the equations can be rewritten in the following form :

where a, b, c, d are parameters to be determined through the homogenisation process. The choice of these parameters is not unique and it is possible, by introducing derivatives of higher order, to convert the fourth order derivatives in time to fourth order derivatives in space and time or only in space. The aim of this post-doc is to study the influence of this choice on the dispersion relations and to compare these relations with exact solutions or numerical approximations. In a second step, the simplest possible Lagrangian will be built to retrieve the equations using variational principles, and extensions will be proposed to take non-linearities into account. Finally, numerical schemes will be constructed for the dispersive equations and compared with direct numerical simulations. The multi-dimensional case will be treated at the end of the post-doc.

Profile: Candidates must hold a Ph.D. in mechanics, acoustics or applied mathematics.

Essential skills: homogenisation for heterogeneous materials. Generalised Continuum Mechanics.

Other skills: High order homogenisation. Numerical modelling. Experimental Validation.

Labex team

Axis : Heterogeneity, multi-scale, change of scale

Action : Heterogeneity, homogenisation and multi-physics coupling

Modelling of heterogeneous media, waves, interfaces and multi-physics coupling

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How to apply

Send an application including:

- A detailed CV with a list of publications
- A cover letter
- A list of scientific personalities able to support the application

to both these addresses:

Relevant group leader (nicolas.favrie@univ-amu.fr)

Labex management (LabexConseilCoordination@irphe.univ-mrs.fr)