



# MARIE Skłodowska-CURIE INNOVATIVE TRAINING NETWORK

## OPEN CALL – PhD position



Swansea University  
Prifysgol Abertawe



UNIVERSITAT POLITÈCNICA  
DE CATALUNYA  
BARCELONATECH



### Host (recruiting) organisation

Swansea University, Swansea, United Kingdom

### Project Title:

A new computational tool for multi-material solid dynamics

### Supervisory team

<b>Primary academic institution</b> Prof. Antonio J. Gil and Dr. C. H. Lee Swansea University	<b>Industrial institution</b> Dr. Rajab Said ESI Group
<b>Secondary academic institution</b> Prof. Antonio Huerta and Prof. Pedro Diez Universitat Politècnica de Catalunya · BarcelonaTech	

### Project description

Traditional displacement-based finite element formulations are typically employed in Industry when simulating complex engineering large strain dynamic problems. However, this approach presents a number of well-known shortcomings, namely a reduced order of convergence for strains and stresses, poor performance in nearly incompressible bending dominated scenarios and numerical instabilities in the form of shear locking, volumetric locking and spurious hydrostatic pressure fluctuations. In addition, these methods used in conjunction with Newmark-type time integrators have a tendency to introduce high frequency noise and accuracy is degraded once numerical artificial damping is employed.

Building upon very recent discoveries made by the supervisory team, the objective of this PhD is the further development of a novel 3D computational framework with significantly improved properties with respect to the current state of the art. Initial implementation has been carried out into the ESI Group’s software OpenFOAM (with built-in parallel computing architecture), with very promising results in some large scale solid dynamics problems. Interestingly, the methodology will borrow concepts from Computational Fluid Dynamics and apply them to Computational Solid Dynamics in a way that will greatly enhance the robustness and accuracy of the simulations, with the final aim to handle advanced multi-physics problems, including fluid-structure interaction.

The recruited PhD candidate will become a member of an active research group working on the development and application of cutting edge computational techniques for large strain solid dynamics, fluid structure interaction and computational multi-physics.



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## Benefits

- Doctorate degree from both Swansea University and UPC·BarcelonaTech.
- Integration within the research group of a virtual prototyping leader
- 36 month full-time employment contract
- Additional mobility and family allowances
- Research supervision and training by recognised experts in computational mechanics from Academia and Industry
- Access to state-of-the-art research and computing facilities
- Training in transversal skills (e.g. communication skills, entrepreneurship)

## Prerequisites

- To have a strong undergraduate and MSc degree (or equivalent) in Engineering, Mathematics, Physics or a related field and a good level of English
- To have an enthusiastic attitude to conduct research, being hard-worker and critic
- To demonstrate knowledge of some programming languages such as Matlab and/or Fortran and/or C/C++
- To demonstrate experience with numerical (Finite Element/Volume, Meshless) methods

## Eligibility

Applicants shall, at the time of recruitment by Swansea University, be in the first four years (full-time equivalent research experience) of their research careers and have not been awarded a doctoral degree. Full-Time Equivalent Research Experience is measured from the date when a researcher obtained the degree, which would formally entitle him/her to embark on a doctorate, irrespective of whether or not a doctorate is or was ever envisaged.

At the time of recruitment by the host organisation, researchers must not have resided or carried out their main activity (work, studies, etc.) in the UNITED KINGDOM for more than 12 months in the 3 years immediately prior to the reference date.

## Duration of the project

The total duration of the project is 36 months.

## Obligations of ESRs

- Completion of the Erasmus Mundus Joint PhD programme Simulation Engineering and Entrepreneurship Development (SEED)
- Be highly committed to quality research, training and management. The successful candidate is expected to become a future leader on the development and application of advanced computational methods for industry
- Take part of the mobility programme both in Academia and Industry
- Participate on the dissemination and outreach activities associated with the project
- Attend international conferences and present the research undertaken
- Contribute to the writing of articles in high impact international journals

## Closing date

Until position is filled

## How to apply

[www.lacan.upc.edu/ProTechTion](http://www.lacan.upc.edu/ProTechTion)

## Questions

[protection.itn@upc.edu](mailto:protection.itn@upc.edu)