



MARIE Skłodowska-CURIE INNOVATIVE TRAINING NETWORK

OPEN CALL – PhD position



Host (recruiting) organisation

Ecole Centrale de Nantes, Nantes, France

Project Title: Micro-structural identification of heterogeneous discontinuous fiber composites through data-driven computational mechanics

Supervisory team

Primary academic institution Dr. Adrien Leygue Ecole Centrale de Nantes	Industrial institution Dr. Benedikt ECK Faurecia
Secondary academic institution Dr. Mathias Hartmann Technical University of Munich	

Project description

Designing Sheet Moulding Compound (SMC) parts or composite laminates with non-homogeneous microstructure must account for the microstructure of the material, that governs the final mechanical properties. Since microstructure is strongly affected by processing history, computer simulations are employed to predict fiber orientation. This information is then used to predict the local composite properties by homogenization of the composite. Despite many efforts, the accurate prediction of the final microstructure is still very challenging for industrial parts and requires many inputs.

An alternative approach will be developed in this project. It is based on an extensive characterization of representative flat parts (thin shell), where the microstructure is controlled by the process. Full-field measurements will be employed to measure the local displacements induced by mechanical and/or thermal loading, and by post-treatment strains and strain gradients on micro-structurally controlled plates will be determined.

A comprehensive data base will be generated to cover representative microstructures configurations encountered in SMC and non-homogeneous composite laminates. Process-controlled microstructures will be correlated to the data obtained by full field measurements using data-mining approach combined to fundamental balance principles. Then a signature of each microstructure will be generated. The proposed method will be applied to predict,



MARIE Skłodowska-CURIE INNOVATIVE TRAINING NETWORK

from full field measurements on the part, the local microstructure in terms of fiber content and fiber orientation.

The validation of the proposed approach should ultimately be made on a 3D industrial SMC part, using stereo-correlation techniques to monitor and record displacement fields.

Benefits

- Doctorate degree from Ecole Centrale de Nantes
- Integration within the TUM/LCC
- Integration within the research group of an automobile industry leader
- 36 month full-time employment contract
- Additional mobility and family allowances
- Research supervision and training by recognised experts in computational mechanics applied to polymer composites from academia and industry
- Access to state-of-the-art research, computing, testing and manufacturing facilities
- Training in transversal skills (e.g. communication skills, entrepreneurship)

Prerequisites

- To have a strong undergraduate and MSc degree (or equivalent) in Computational Mechanics 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
- To have some experience with Finite Element techniques

Eligibility

Applicants shall, at the time of recruitment by the Ecole Centrale de Nantes, 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 FRANCE 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 with 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 to the project
- Attend international conferences and present the research undertaken
- Contribute to the writing of articles in high impact international journals



MARIE Skłodowska-CURIE INNOVATIVE TRAINING NETWORK

Closing date

Until position is filled

How to apply

www.lacan.upc.edu/ProTechTion

Questions

protection.itn@upc.edu