

PhD Position in Structural Mechanics Group: “Non-linear numerical analysis of composite beam structures using a multiscale method based on domain decomposition” (VAC-2021-82)

Title of the PhD project: Non-linear numerical analysis of composite beam structures using a multiscale method based on domain decomposition

INTRODUCTION:

The International Centre for Numerical Methods in Engineering (CIMNE, www.cimne.com) is a research centre, created in 1987 by consortium between the Catalan Government and the Universitat Politècnica de Catalunya (UPC-BarcelonaTech), devoted to the development and application of numerical methods to a wide range of areas in engineering. CIMNE has been selected as a Severo Ochoa Centre of Excellence for the period 2019-2023, the highest level of recognition of excellence and leadership awarded to a research centre in Spain.

POSITION DETAILS

Number of vacancies: 1

Category: PhD (PHD2)

Location: Barcelona

Yearly salary (gross): 17.563,14 EUR

Working hours: Full time

Duration: 3 years

Starting date: No later than January 2021

FUNCTIONS TO BE DEVELOPED BY THE APPLICANT

CIMNE is looking for a **PhD Researcher** to be part of the Research and Technical Development (RTD) Group on Structural Mechanics.

The functions assigned to the candidate will be:

- Complete a PhD on Structural Analysis doctoral program at Universitat Politècnica de Catalunya – Barcelona Tech. The candidate is expected to complete the PhD thesis in a maximum of three years.
- Collaborate with various research groups within CIMNE and worldwide.
- To publish a minimum of two papers in JCR journals during the PhD period, author and co-author articles in high-impact international journals
- Carry out quality research, training and management.

- Participate on the dissemination and outreach activities associated with the project
- Participate in international conferences presenting her/his work

DESCRIPTION OF THE PHD PROJECT:

Classic beam theories are insufficient for the analysis of beams with a complex material micro-structure, such as composites, or with a complex geometric configuration. In order to minimize the numerical cost of these analysis, maintaining an optimal accuracy in the solution, this work will use the formulation developed by J.A. Hernandez [1] in which the beams are solved using a multiscale method using a domain decomposition and ECM-hyperreduction models. This formulation will be extended to the non-linear range and applied to the solution of composite structures. In order to increase the capabilities of the formulation to solve large structures, it will be implemented in Femuss finite element code, which will allow to solve i.e. structural problems interacting with fluids.

The models developed will be applied to analyse curved pultruded profiles [2], which will be manufactured and tested in the framework of Fibre4yards EU project [3].

References

1. J.A. Hernández, A multiscale method for periodic structures using domain decomposition and ECM-hyperreduction. Journal of computer methods in applied mechanics and engineering Vol 368. 2020. DOI: 10.1016/j.cma.2020.113192
2. I. Saenz-Dominguez, I. Tena, A. Esnaola, M. Sarrionandia, J. Torre, J. Aurrekoetxea. Design and characterisation of cellular composite structures for automotive crashboxes manufactured by out of die ultraviolet cured pultrusion. Composites Part B: Engineering Vol. 160. 2019. DOI: 10.1016/j.compositesb.2018.10.046
3. FIBRE4YARDS Project. <https://www.fibre4yards.eu/> (accessed Nov. 08, 2021)

REQUIREMENTS

1. The PhD candidates will need a Masters degree in Naval or Aeronautical Engineering
2. The PhD candidate has to have taken courses along this academic formation on Numerical Analysis of Structures and will need programming skills.
3. Past experience on the use of Finite Element Methods for the solution of linear and non-linear problems will be acknowledged.

EVALUATION OF CANDIDATES

The requirements and merits will be evaluated with a maximum mark of 100 points. Such maximum mark will be obtained by adding up the points obtained in the following items:

- Academic record (60%)
- Previous research and academic experience in the field of the position (20%)
- Programming skills (10%)
- Language skills (10%)

HOW TO APPLY

Candidates must complete the "Application Form" form on our website, indicating the reference of the vacancy and attaching the following documents **in English**:

- Curriculum vitae
- A motivation letter
- Academic transcripts from all Undergraduate and MSc degrees
- Name and institutional contact information of two possible referees

The deadline for registration to the offer ends on 26th November, 2021 at 12 noon.

The shortlisted candidates may be called for an interview. They may also be required to provide further supporting documentation.

CIMNE is an equal opportunity employer committed to diversity and inclusion. We are pleased to consider all qualified applicants for employment without regard to race, colour, religion, sex, sexual orientation, gender identity, national origin, age, disability or any other basis protected by applicable state or local law. CIMNE has been awarded the HRS4R label.