

## PhD Position in Structural Mechanics Group: “Analysis and failure prediction of engineering composite structures under cyclic loads” (VAC-2021-39)

**Title of the PhD project:** Analysis and failure prediction of engineering composite structures under cyclic loads

### INTRODUCTION:

The International Centre for Numerical Methods in Engineering (CIMNE, [www.cimne.com](http://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 Sept 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:

Most engineering structures are usually made with metallic materials. The main drawbacks of using these materials are their durability due to corrosion problems, and the high maintenance cost associated to the protection of the structure against corrosion and the difficulties to access to the structure. Composite materials are an excellent alternative, as they have an excellent corrosion performance in harsh environments, as well as they have excellent mechanical properties. These materials have also an excellent response to cyclic loads, which are one of the main actions on these structures. However, the fatigue failure of composite materials is a subject that is still under study, and there is yet no analysis procedure that can predict accurately their response.

Based on these premises, the main aim of the PhD study will be to develop a numerical tool to predict the fatigue failure of large composite structures subjected to cyclic loads. This tool will allow the reduction of the uncertainty related to the performance of such structures and the safety factors on their design and defined laminate thicknesses. Reducing the composite thickness implies a reduction on the weight of such structures and more reliable designs, which is beneficial from both points of view, both economic and environmental.

## References

J. Jurado, X. Martinez, N. Nash, C. Bachour, I. Manolakis, A. Comer, D. Di Capua (2019) Numerical and experimental procedure for material calibration using the serial/parallel mixing theory, to analyze different composite failure modes, *Mechanics of Advanced Materials and Structures*, DOI: 10.1080/15376494.2019.1675106

L.G. Barbu, S. Oller, X. Martinez, A.H. Barbat. High-cycle fatigue constitutive model and a load-advance strategy for the analysis of unidirectional fiber reinforced composites subjected to longitudinal loads. *Composite Structures*: 220, pp. 622-641. 2019. DOI: 10.1016/j.compstruct.2019.04.015

L.G. Barbu, S. Oller, X. Martinez, A. Barbat. High cycle fatigue simulation: A new stepwise load-advancing strategy. *Engineering Structures*, Vol 97, pp. 118-129. 2015

## REQUIREMENTS

1. The PhD candidates will need a Masters degree in Civil, Mechanical, 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. A good command of English
4. An enthusiastic attitude to conduct research, being hard-worker and critic

## 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 31<sup>st</sup> May, 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.***