PhD Studentship

Department of Mechanical Engineering
University College London

Modelling the response of soft membranes for lightweight structures in extreme conditions

Description:

Structural membranes are widely used in engineering due to their ability to undergo large deformations, with applications ranging from civil constructions (e.g. inflatable roof stadium) to advanced aerospace systems (e.g. NASA Superpressure Balloons and membrane antennas), and including biomedical devices, soft robotics, stretchable electronics, and tissue engineering. Although these thin films are extremely lightweight, with submillimeter thickness and low areal density, they can withstand severe thermal and mechanical loading conditions. However, the highly deformable solids employed in these lightweight membrane structures are difficult to characterise and control, thus limiting the long-term response and the life of the engineered systems.

The project aims to predict the behaviour of soft membranes under a wide range of thermal and mechanical loading conditions through the development of advanced and accurate nonlinear constitutive models. In particular, a major task will be to develop a reliable method to assess the (visco)elastoplastic transition in inflatable thin films constituted of different structural materials, mainly for aerospace applications. Advanced mathematical modelling of solid mechanics and numerical simulations (finite element method) will be employed to establish constitutive relations and evaluate systems performances. A variety of experimental tests will be designed and conducted throughout the entire project to characterise and validate the material and the structural responses. Experiments will include the use of electromechanical testing machine, digital image correlation technique, inflatable test boxes, and environmental chamber.

The successful candidate will have the opportunity to gain experience and contribute to the development of new theoretical, numerical and experimental research methods. As a PhD student at UCL you will benefit from mechanical engineering research training, high-performance computing, and experimental laboratories. Furthermore, you will be encouraged to publish your work in leading peer-reviewed journals and present your findings at the most important national and international conferences.

Person Specification:

Applicants must have a UK-equivalent first degree in solid mechanics, structural/mechanical/materials engineering or a related discipline. Experience with material and structural modelling, experimental characterisation, and numerical simulations is a significant advantage. Excellent organisational, interpersonal and communication skills are essential.

Closing Date and Start Date:

 We will be continuously having informal discussion with interested candidates until this position is filled.

Value of award:

Full tuition fees and a tax-free stipend of up to £17,500 per annum for three years.

Eligibility:
This funding is for UK/EU nationals and overseas candidates. Please refer to the following website for eligibility criteria:
http://www.ucl.ac.uk/prospective-students/graduate/research/degrees/mechanical-engineering-mphil-phd

Application Process:

Eligible applicants should first contact Dr F. Bosi (f.bosi@ucl.ac.uk) enclosing a CV (including the names and contact details of two referees), the transcript of results (listing all subjects taken and their corresponding grades/marks), and a cover letter stating how the project meets your research interests

The supervisory team will arrange interviews for short-listed candidates. After interview, the successful candidate will be given instructions to formally apply online via the UCL website. For further information, see http://www.ucl.ac.uk/prospectivestudents/graduate/research/application.