Title: Micromechanics of Fatigue Damage – predictive model development

Type of award PhD Research Studentship

Department Mechanical Engineering

Scholarship Scholarship (subject to confirmation) will cover full UK/EU (EU applicants who have been resident in the UK for 3 years prior to application) PhD tuition fees and a tax-free stipend at the current RCUK rate (£14,296 in 2016/17). EU nationals resident in the EU may also apply but will only qualify for PhD tuition fees.

Duration 3.5 years

Eligibility Home/EU applicants

Start Date Open until filled

PhD Topic Background/Description
Fatigue in metals is one of the most common modes of failure in metallic components and remains one of the key challenges for designers for components diverse as aeroengines, microelectronics and off-shore wind turbine. Historical approaches to predicting fatigue life, and in particular crack initiation, have focussed on simple fitting to vast amounts to generated data to account for variables such as strain/stress range on the number of cycles to failure. This is time consuming, does not allow for material development and cannot be extrapolated with any confidence.

At a micromechanical level it is known that the fatigue defects evolve from a number of potential sources such as plastic slip bands, grain boundaries or cracked second phases. These ‘small’ cracks develop and grow in a very stochastic which is highly dependent upon the local microstructure, but to date nobody has linked this local information with the overall life of a test specimen and the inherent scatter thereof.

The focus of this PhD is to combine modelling and experiment to develop a holistic method for predicting crack initiation and short crack growth which implicitly considers the stochastic nature of the process in a simple metallic system. The work will involve:

- Build on recent advances in micromechanical modelling through crystal plasticity
- Development of state of the art measurement techniques, in particular DIC, for determining crack development and growth
- Capturing the influence of local microstructure from electron microscopy from incorporation into the model

There will be close collaboration with activities at Imperial College. It is anticipated that the successful student will spend considerable time in London.
Candidate Requirements
Applicants should have (or expect to obtain by the start date) a First Degree in Materials Science or Engineering at 2:1 or above.

Scholarship Details
A minimum £14,296 p.a. for 2016/17 (subject to confirmation of scholarship).

Informal enquiries
For informal enquiries, please email Prof David Knowles, david.knowles@bristol.ac.uk

For general enquiries, please email gsen-pgrs@bristol.ac.uk

Application Details
To apply for this studentship submit a PhD application using our online application system [www.bristol.ac.uk/pg-howtoapply]

Please ensure that in the Funding section you tick “I would like to be considered for a funding award from the Mechanical Engineering Department” and specify the title of the scholarship in the “other” box below with the name of the supervisor Prof David Knowles.

Apply now