

PhD studentship: Nonlinear analysis of the biodynamic responses of the human body during whole-body vibration

Department of Mechanical and Design Engineering, Faculty of Technology,
University of Portsmouth, Portsmouth, UK

Applications are invited for a three-year PhD studentship to study modelling of a nonlinear biodynamic response in human vibration. The project is funded by the Department of Mechanical and Design Engineering inline with a newly developed vibration lab area within an established and well-equipped mechanical testing environment. The successful applicant will join a strong team of researchers at the Biomechanics group of the Mechanical Behaviour of Materials (MBM) section within the department
(<http://www.port.ac.uk/research/mbm/biomechanics>).

Funding The studentship will fully cover University tuition fees at home/EU level (£3466 per year in 2010) and will provide a tax-free bursary of £13,590 per year for a three-year duration. Home/EU applicants are eligible for full funding; overseas applicants will be expected to pay the fee difference from other sources.

Project Description Vibration transmitted to the human body is widely presented in the day-to-day life of modern industrialized societies. Commuters travel by car, train, or bicycle; rescue crews by helicopters and boats. These expose the body to vibration with different waveforms, durations, and magnitudes. An understanding of how motions are transmitted to and through the body is a prerequisite for understanding how vibration affects comfort and health. Key to this understanding is the fact that biodynamic responses measured in transmissibilities and apparent mass show resonance frequencies that decrease with increasing excitation magnitude – the biodynamic nonlinearity. Current standards evaluating human exposure to vibration uses ‘idealized’ values that assume the same frequency responses of the human body at substantially different magnitudes of vibration. The goal of the current project is to provide quantification tools to evaluate the nonlinearity.

The research will focus on developing analytical techniques from nonlinear dynamics, such as multi-input frequency response identification and viscoelastic models, so as to examine the nonlinearity seen in frequency response functions of human vibration. The aim is to quantify the biodynamic nonlinearity. An essential part of the study will involve development of experiments to measure frequency response functions of specimens of animal soft tissues exposed to different waveform and magnitudes of vibration. The soft tissue data, as well as responses previously measured during whole-body vibration, will provide validation of the nonlinear analysis technique.

The project is multidisciplinary and involves advanced signal processing, mechanical engineering, biomechanics, applied mathematics, and human physiology and anatomy.

Training opportunity in research and teaching and/or teaching support will be provided.

Entry requirements Candidates will have a first or upper second class degree (or equivalent) in relevant disciplines, e.g. sound and vibration, mechanical and electronic engineering, biomechanics, applied mathematics, and physics.

Candidates with previous experiences in signal processing, frequency response functions, measurements of sound and vibration, control and MATLAB would be beneficiary.

The successful candidate will work with a group of highly motivated research students in the areas of experimental and analytical biomechanics.

Commence date 1st October 2011

Closing date 22nd July 2011

Interview will take place during the week starting 1st August 2011. Applicants invited to interview will be asked to give a short presentation as part of the selection process.

Further information If you wish to discuss any details of the project informally, please contact academic supervisor: Dr Ya Huang, Email: ya.huang@port.ac.uk, Tel: +44 (0) 2380 59 2343.

How to apply

An online application form with guidance notes can be accessed here:
<http://www.port.ac.uk/courses/postgraduate/howtoapply/researchdegrees/formsrequired>

Please read the notes carefully before applying. Applications will only be considered on receipt of a completed application form. You can attach supporting documents to the application form, e.g. a CV, personal statement or covering letter.

Please ensure you include a personal statement or covering letter in your application, stating why you particularly want to pursue a PhD degree, and what particularly attracts you to this project.

Please quote the title of the post and supervisor Dr Ya Huang in your application form.

If you are unable to submit your application form online, please email, post or fax your application to:

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