Curtin University

PhD Research Scholarships in Fluid-Structure Interaction

Two PhD students are sought to work on an Australian Research Council Discovery project entitled, "Fluid-Structure Interactions in Flows through Flexible-Walled Channels", being undertaken by a team of researchers - A/Prof Ramesh Narayanaswamy, Dr Nima Nadim, and Dr Julien Cisonni - from Mechanical Engineering at Curtin University and led by John Curtin Distinguished Emeritus Professor A.(Tony)D. Lucey.

Project Description

The ARC-published project summary is as follows:

"This project seeks to deliver a definitive understanding of the behaviour of steady and pulsating fluid flow through compliant-walled channels and pipes. Novel theoretical stability-analyses and experimental investigations, complemented by targeted numerical simulations, will be developed and used to identify and categorise fluid- and wall-based wave-disturbances and their interactions. This can underpin the development of technologies that control these flows to advantage in both engineered fluid-flow and biologically occurring systems. Robust design guidelines will emerge to safeguard and enhance the use of compliant liners and flexible panels for drag and noise reductions, or to protect surfaces exposed to fluid flows."

The two intersecting PhD projects lie in the broad areas of experimental investigation (guided by R. Narayanaswamy and J. Cisonni) and computational modelling and simulation (guided by N. Nadim and J. Cisonni) and are overviewed below. Note that the PhD students may also have the opportunity to work with the team's international Partner Investigators in the UK (Prof Chris Davies, Leicester University) and India (Prof Viswanathan Shankar, I.I.T. Kanpur).

PhD1: Experimental investigation of flows through compliant-walled channels

An experimental facility will be designed, built, commissioned and deployed to observe, measure and categorise the different types of coupled flow and wall behaviours. A novel valve, designed in a previous research project, will be used to generate different types of pulsatile flow. Measurement techniques will include the use of PIV for the flow and high-speed imaging to capture the dynamic deformation of the flow-wall interface.

PhD2: Computational modelling and numerical simulation of flows through compliant-walled channels

The fluid-structure system planned for the experimental investigation will be modelled using commercial software, combining Computational Fluid Mechanics (CFD) and Finite-element Analysis (FEA) using a hybrid (LES and k-ω SST) for the turbulent-flow cases. Simulations will be conducted for targeted cases identified by the theoretical investigations as a two-way validation and to expose further physics missed through the modelling assumptions of theory or phenomena that emerge through the experimental investigations.

Application process and Enquiries

Candidates are requested to send a (maximum) two-page document that addresses the selection criteria and outlines their motivation for PhD study in the area of the overall project. However, it is also essential to identify to which one (or more) of the PhD positions - PhD1 or PhD2 – they are applying. Candidates are also required to provide a current curriculum vitae (CV or Resume) that outlines their academic record, work experience, and extra-curricular activities.

Please send your application (or enquiries regarding the scholarships) to Professors Tony Lucey and Ramesh Narayanaswamy at: t.lucey@curtin.edu.au and r.narayanaswamy@curtin.edu.au.

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Scholarship Details

Course type

Higher Degree by Research – Mechanical Engineering

Funding

This scholarship provides a living stipend of $28,597 p.a. pro rata indexed, based on full-time studies, for up to a maximum of 3 years.
Successful international students will be considered for a HDR tuition fee sponsorship, if successful in receiving the scholarship.

Eligible Citizenships

- Australian Citizen
- Australian Permanent Resident
- New Zealand Citizen
- Permanent Humanitarian Visa
- International Student

Eligible courses

Graduates from a recognised honours-level Mechanical Engineering degree are eligible for both PhD positions while graduates from an honours degree in Applied Mathematics or Applied Physics will considered for PhD1 and PhD2 above.

Eligibility criteria

The assessment of potential candidates is made primarily on the basis of academic results from Bachelor and Master degree studies. Special attention is paid to the following:

Essential

- Completion of a Bachelor (Honours) or Master by Research degree in Mechanical Engineering (PhDs1&2), Applied Physics (PhD2), or related disciplines.
- Specialised knowledge and skills (at final-year undergraduate or Masters level) in Fluid Mechanics and supporting knowledge of solid mechanics and vibration.
- Demonstrated knowledge in at least one of the two following areas: (i) Experimental design and measurement techniques (ideally, PIV) for PhD1, and (ii) Computational fluid dynamics and numerical methods for PhD2.
- At minimum, a workable level of programming skills (e.g. C++, Matlab, Python).
- Demonstrated written and oral communication skills with very good proficiency in English.

Desirable

- Demonstrated knowledge of Fluid-Structure Interaction.
- Demonstrated ability to work independently (e.g. formulate and tackle research problems) and interact effectively with a research-project team.
- Demonstrated academic research experience as evidenced by publications in journals or conferences.
- Be possessed of excellent organisational skills, analytical thinking, and able to multitask within tight time-frames

Enrolment requirements

Recipients must complete their Milestone 1 (preparation of a written research plan and its oral presentation to the thesis committee) within 6 months of enrolment and remain enrolled on a full time basis for the duration of the scholarship.