UNSW
SYDNEY

UNSW PhD opportunities

ARC Training Centre for Automated Manufacture of Advanced Composites
Design, Integration and Optimization Research Program

The Australian Research Council (ARC) Training Centre for Automated Manufacture of Advanced Composites (AMAC) will develop the next generation of industry-focused innovators and researchers in the field of advanced composites manufacturing for industry. The Centre is administered at UNSW Sydney in collaboration with Australian National University (ANU), Canberra and the Technical University of Munich (TUM), Germany. The Centre also involves several industry partners representing several high-performance industry sectors, including defence, aerospace, automotive and elite sport. The main aims of the Centre are to:

• Provide industry-focused research training to a generation of composite manufacturing innovators
• Promote integrated innovation in composites manufacture, from material design to product realisation
• Incorporate key Australian composites innovations into the automated manufacturing process chain
• Foster strong collaborations between Australian universities and a host of global organisations and
• Enhance Australia's R&D capability in the field of advanced composite manufacturing.

The Centre is seeking applicants for a PhD on ***Rework and repair of thermoplastic liners***, as detailed below, to be based at UNSW Sydney. A tax-free scholarship of AU$31,298 is available to successful candidates for 3 years, with a possible 6-month extension. It is a condition of the scholarship that the successful applicant accumulates 1-year of industry-based research training with one or more of the AMAC industry partners during their candidature. The partners for this project currently include the **Omni Tanker**, **ACS-A** and **ANSTO.**

PhD Project Title
Rework and repair of thermoplastic liners

Project Background and Description

Tanks for corrosive chemical transport have been developed by using high integrity lining technology. The lining technology is based on the concept of seamless low residual stress production, resulting in an extremely low tendency for environmental stress cracks, and other forms of damage and/or failure occurring as a result of chemical contact, to form. Repair of damages of such liners is being used by now is thermoplastic welding. However, use of a weld causes the introduction of seams and a localised thermal residual stress field. Thermoplastic weld seams are known failure points, which can crack and fail over time. The result of this cracking is not expected to be catastrophic, but may result in the need for additional repair operations and a reduced integrity product. The objective of this project is to understand the effect of welding, and determine methods of overcoming problems that occur in subsequent service, through the collection of data development of a method of pre-treatment of the intended weld area or a treatment post welding. The following tasks are expected to be performed:

- Finite element simulation to aid the development of understanding on the effect of thermal residual stress fields and their effect on the tank structure.
- Time dependent creep model to predict thermal residual stresses and determine delay times and/or annealing protocols for placing repaired and reworked structures into service.
- Case study on repair and rework of large structures, modelled and correlated to experiments.

PhD Candidate Selection Criteria

• Bachelor (Honours) or Master degree in Mechanical, Materials or Manufacturing Engineering; at 1st class or upper second class level, or equivalent
• Demonstrated research capability (e.g. through thesis work) in the area of fibre composite materials
• Evidence of industry experience relevant to the proposed field of study
• Demonstrated ability to create impact for industry partners
• Highly developed design, analysis, experimental and modelling skills for composite materials
• Highly developed interpersonal, communication and management skills

Application Process

Applications should be submitted to Professor Gangadhara Prusty. The application should consist of a CV, a statement addressing the selection criteria, a transcripts, graduation certificates and testamurs of previous tertiary study. Three referees must also be nominated. All applicants are encouraged to use the HDR Self-Assessment Tool https://selfassessment.research.unsw.edu.au/ to help give an indication of your eligibility and competitiveness for a scholarship (please attach a screenshot of the outcome in your application).

Enquiries: Professor Gangadhara Prusty, E: g.prusty@unsw.edu.au

UNSW
THE UNIVERSITY OF NEW SOUTH WALES

CANBERRA

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• Enhance Australia's R&D capability in the field of advanced composite manufacturing.

The Centre is seeking applicants for a PhD on ***Penetration resistance into hybrid metal-composite structures***, as detailed below, to be based at UNSW Canberra. A tax-free scholarship of AU$31,298 is available to successful candidates for 3 years, with a possible 6-month extension. It is a condition of the scholarship that the successful applicant accumulates 1-year of industry-based research training with one or more of the AMAC industry partners during their candidature.

PhD Project Title
Penetration resistance into hybrid metal-composite structures

Project Background and Description

Hybrid metal laminate composites comprise of a metallic layer with a fibrous composite structure directly attached to the metal. These structures have the potential to offer improved impact resistance performance and damage tolerance over and above single-layer metal plates by controlling the rate of deformation. The project will comprise of both computational and experimental work and will probe the role of the composite layer in controlling the deformation of the metallic front-face. This will have applications in developing crash-resistant and enhanced blast-resistant structures. The student will be expected to undertake the following tasks:

- Develop a metal-hybrid system using established approaches
- Develop FE models to evaluate the stress response of the composite layer during dynamic indentation
- Evaluate the failure mechanisms that occur during dynamic indentation using FE approaches and experimentation
- Develop a path to optimise structure design.

PhD Candidate Selection Criteria

• Bachelor (Honours) or Master degree in Mechanical, Materials or Manufacturing Engineering; at 1st class or upper second class level, or equivalent
• Demonstrated research capability (e.g. through thesis work) in the area of fibre composite materials
• Evidence of industry experience relevant to the proposed field of study
• Demonstrated ability to create impact for industry partners
• Highly developed design, analysis, experimental and modelling skills for composite materials
• Highly developed interpersonal, communication and management skills

Application Process

Applications should be submitted to Professor Paul Hazell. The application should consist of a CV, a statement addressing the selection criteria, a transcripts, graduation certificates and testamurs of previous tertiary study. Three referees must also be nominated. All applicants are encouraged to use the HDR Self-Assessment Tool https://selfassessment.research.unsw.edu.au/ to help give an indication of your eligibility and competitiveness for a scholarship (please attach a screenshot of the outcome in your application).

Enquiries: Professor Paul Hazell, E: p.hazell@adfa.edu.au