Research Centre: I-Form, APT
Post title: Post-doctoral Researcher in Laser Machining
Level on framework: Level I
Post duration: Fixed Term Four Year Contract

As part of this role the researcher will be required to participate in the DCU Research Career Framework. This framework is designed to provide significant professional development opportunities to Researchers and offer the best opportunities in terms of a wider career path.

Background
Dublin City University (DCU) is one of the largest universities in Ireland. Its student population is approximately 17,500, including 500 research postgraduates and over 1,800 taught postgraduate students, plus around 3,000 distance education students. DCU is a research-led university which has developed its own research specialists, established internationally recognized centres of excellence that have substantive collaborative links with leading universities and industrial partners. DCU has a strong track record in attracting both Irish and European Union research funding under Horizon 2020 (and all previous Framework Programmes), Marie Curie Actions and Erasmus. We offer a dynamic and internationally-focused environment in which to advance your academic career.

APT Centre and I-FORM: The Advanced Processing Technology Research Centre (APT) (http://aptcentre.ie/) focuses on state of the art research activities in the areas of Production Technology, Product Design & Sustainability, Micro and Nano Systems Technology, Advanced Materials Engineering and Bio Systems. The APT is a leading international research centre which as a primary goal strives to provide significant translational benefit to the wider community. Research projects undertaken within APT are conducted to a world class level and support local and internationally based enterprises. The APT research group has established a strong infrastructure of equipment and people in the area of processing technologies at DCU. APTs education and outreach events include seminars and courses which enable the transfer of processing technologies knowledge to the broader community.

I-FORM (http://www.i-form.ie/) is the SFI Research Centre for Advanced Manufacturing and its mission is to shape the future of manufacturing through high-impact research into the application of digital technologies to materials processing. Also hosted within I-Form is the EPSRC/SFI Funded Center for Doctoral Training in Advanced Metallic Systems (http://www.metallicscdt.co.uk/).
Research Project: PhD in Laser-based nano-texturing of graphene coated membranes

As partner on a H2020 project, DCU has secured funding for a four-year project to advance the nano-structuring of surfaces for and membranes and their application to offer material solutions to address Sustainable Development Goals resulting in a positive manner for the society and industrial partners. To solve this challenge, within industry sectors such as mining and transport, an open innovation text bed facility will be developed at DCU. Specifically, this project involves the development, implementation, and characterisation of laser machining techniques for nano-machining and nano-patterning of surfaces and membranes of different material types. Wear in engineering systems is one of the largest costs in the maintenance of engineered systems. The application of laser surface texturing can reduced friction and wear within engineering equipment including within bearings, pistons, gears, and rock drills systems.

Building on an advanced laser system already implemented at DCU, the PhD student will input into the design and implementation of the advanced laser processing techniques of Laser Induced Periodic Surface Structuring (LIPSS) and Optical Wavefront Shaping (OWS). The system will be developed, commissioned and characterised without this project and applied for various industrial partner applications. One focus of this project will be the nano-structuring of membrane surfaces which have been coated in graphene / graphene oxide or other 2D-materials. A roll to roll system will be integrated within the laser texturing facility to allow for the upscaling of laser surface texturing. Industrial applications include sectors such as water purification, cavitation control, increased efficiency and lifetime of engineering motion systems, such as moving structures within mining and transport systems related applications.

This project work will be conducted within the APT group at DCU and includes a DCU partner colleagues as well as 35 EU project partners. The project involves the specification, development, and upgrade of a 4-axis laser machining facility. The facility will be optimised for advanced micro- and nano-structure of flat polymer membranes and complex shaped metallic parts. The researcher will be accountable for the integration of advanced nano-structuring techniques including Optical Wavefront Shaping (OWS) and Laser Induced Periodic Surface Shaping (LIPSS). This platform will then be used to conduct a number of industry focussed feasibility studies.

Principal Duties and Responsibilities

Reporting to Professor Brabazon, the duties will include but not be limited to:

- Conduct a specified program of research within the project under the supervision of the Professor Brabazon
- Lead all activities related to the specification, mechanical design, system / optics design, software control development, and upgrade of a 4-axis laser machining platform and optimise its performance for applications in nano-texturing of a variety of surfaces.
- Test and validate the machining platform under a variety of conditions. Conduct advanced metrology and microscopy to validate the platform performance.
• Promote engagement with industry and conduct a number of industry focussed feasibility studies related to the project. Promote engagement with industrial partners and other stakeholders.
• Support research partners in nano-structuring surfaces for a range of applications such as cavitation mitigation in pump impellors and reduction in bio-fouling in coated membranes.
• Assist in reporting of outcomes to the funding body and other stakeholders.
• Generate SOPs, maintain good design control documentation and control software.
• Authoring of scientific publications, technical reports, presentation at international conferences, and engagement in marketing and outreach activities as required for the project.
• Engage in appropriate training and professional development as recommended or required by Dublin City University

**Minimum Criteria**

Applicants should have a PhD in Mechanical Engineering or Physics or a cognate discipline with a specialism and proven track record related to laser machining or laser physics. They should have practical laboratory experience designing and building experimental research platforms / instrumentation. They should have a proven aptitude for laboratory work and a hands-on ability to build, test and validate laser-based test-beds. They should have good communication and reporting skills.

In addition, the following is desirable:
• Expertise in advanced nano-structuring techniques such as OWS and LIPSS.
• Expertise and know-how in advanced metrology and microscopy methods
• Experience in Solidworks CAD
• Experience with LabVIEW control software
• Experience writing tenders and purchasing high value equipment

**Mandatory Training:** The post holder will be required to undertake the following mandatory compliance training: Orientation, Health & Safety and Data Protection (GDPR). Other training may need to be undertaken when appropriate.