



<b>Research Centre</b>	I-Form, APT
<b>Post title</b>	Post-Doctoral Researcher in Laser Machining
<b>Level on Framework</b>	Level 1
<b>Post duration</b>	1 Year Fixed Term Contract

### **Dublin City University**

Dublin City University (DCU) is a young, ambitious and vibrant university, with a mission 'to transform lives and societies through education, research, innovation and engagement'. Known as Ireland's 'University of Enterprise', DCU is a values-based institution, committed to the delivery of impact for the public good. DCU was named Sunday Times Irish University of the Year 2021.

DCU is based on three academic campuses in the Glasnevin-Drumcondra region of north Dublin. More than 18,000 students are enrolled across five faculties – Science and Health, DCU Business School, Computing and Engineering, Humanities and Social Sciences and DCU Institute of Education.

DCU is committed to excellence across all its activities. This is demonstrated by its world-class research initiatives, its cutting-edge approach to teaching and learning, its focus on delivering a transformative student experience, and its positive social and economic impact. The university continues to develop innovative programmes in collaboration with industry, such as the DCU Futures suite of degrees, which are designed to equip graduates with the skills and knowledge required in a rapidly evolving economy.

DCU's pursuit of excellence has led to its current ranking among the top 2% of universities globally. It is also one of the world's Top Young Universities (QS Top 100 Under 50, Times Higher Top 150 Under 100). In the Times Higher Education University Impact Rankings 2021, DCU ranked 23rd in the world for its approach to widening participation in higher education and its ongoing commitment to eradicating poverty, while it ranks 38th globally for its work in reducing inequality and 89th globally for gender equality.

The university is ranked 23rd in the world and first in Ireland for its graduate employment rate, according to the 2020 QS Graduate Employability Rankings. Over the past decade, DCU has been

the leading Irish university in the area of technology transfer, as reflected by licensing of intellectual property.

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.

### **The Advanced Processing Technology Research Centre & I-Form**

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 Centre for Doctoral Training in Advanced Metallic Systems (<http://www.metallicscdt.co.uk/>).

### **The 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.

### **The Role**

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 responsible 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**

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 or his or her nominee.
- 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. Support 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 impellers 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.

### **Qualifications, Skills and Experience Required**

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

**Candidates will be assessed on the following competencies:**

**Discipline knowledge and Research skills** – Demonstrates knowledge of a research discipline and the ability to conduct a specific programme of research within that discipline

**Understanding the Research Environment** – Demonstrates an awareness of the research environment (for example funding bodies) and the ability to contribute to grant applications

**Communicating Research** – Demonstrates the ability to communicate their research with their peers and the wider research community (for example presenting at conferences and publishing research in relevant journals) and the potential to teach and tutor students

**Managing & Leadership skills** - Demonstrates the potential to manage a research project including the supervision of undergraduate students

#### **Essential Training**

Training required for the role should be entered here. At a minimum, the following should be entered in addition to other applicable, role specific mandatory training:

The postholder will be required to undertake the following essential compliance training: Orientation, Health & Safety and Data Protection (GDPR). Other training may need to be undertaken when required.

***Dublin City University is an equal opportunities employer.***

***In line with the Employment Equality Acts 1998 – 2015, the University is committed to equality of treatment for all those who engage with its recruitment, selection and appointment processes.***

***The University's Athena SWAN Bronze Award signifies the University's commitment to promoting gender equality and addressing any gender pay gaps. Information on a range of university policies aimed at creating a supportive and flexible work environment are available in the [DCU Policy Starter Packs](#)***