



## Institute of Technology

### Ciência sem Fronteiras / Science Without Borders

#### Postgraduate Project Template

<b>Institution:</b>	Galway Mayo Institute of Technology (GMIT), Dublin Road, Galway, Ireland.
<b>Title of Postgraduate Opportunity:</b> (include level of study)	PC-MRI Calibration using Experimental Fluid-Structure Interaction based on Anatomical Calibrated Phantoms
<b>PI Name &amp; Contact Details:</b>	Dr. Patrick Delassus Tel: +353 91 742419 <a href="mailto:patrick.delassus@gmit.ie">patrick.delassus@gmit.ie</a>
<b>Department/School:</b>	Engineering
<b>Research Centre /Group:</b>	GMedTech – Galway Medical Technologies Centre
<b>Research Centre/Group website:</b>	<a href="http://www.gmedtech.ie">http://www.gmedtech.ie</a>
<p><b>Brief Summary of PI research / research group /centre activity:</b> GMedTech – Galway Medical Technologies Centre. Since 2006, the GMedTech centre which was formerly established under the Enterprise Ireland Applied Research Enhancement scheme has developed capabilities in generating realistic vascular models from medical images with the main objective of computationally and experimentally modelling different physiological flow conditions through these vessels. These systems provide the best physiological dynamic models necessary for assessing medical procedures and optimising medical devices for industrial proposes.</p> <p>The unique feature within the GMedTech centre is the capacity for designing and developing <i>In vitro</i> testing systems for replicating various haemodynamic conditions through different parts of the cardiovascular system that may or may not incorporate a disease type. This unique capability was recognised at last Summer’s ASME Summer biomedical engineering conference in Farmington, Pennsylvania, USA in which the researchers within the GMedTech centre was approached by the fluids committee to provide benchmarking test data for next year’s ASME summer biomedical engineering conference for the inaugural CFD challenge workshop. These test systems can prove the feasibility of a product or surgical procedure, assess various disease conditions and provide benchmarking data for the validation of computational analysis. A successful <i>in vitro</i> test system can keep animal testing and clinical trials to a minimum.</p> <p>Research Themes: Experimental Bio-fluid Dynamics, Numerical Bio-fluid Dynamics FEA/CFD/FSI, Design and Development Support Services, Medical Imaging.</p>	
<p><b>Brief Description of Masters or PhD Project:</b> The overall aim of this research is to develop a correction protocol and/or calibration algorithm to allow for enhanced PC MRI measurement capabilities, improved imaging of flow and vessel wall interaction and stress concentration assessment for cardiovascular diagnostics and prognostics. Realistic cardiovascular phantom production capabilities and experimental fluid mechanics quantification expertise available in GMedTech, and <i>in vitro</i> displacement</p>	

quantification expertise within the Medical Imaging and Clinical Applications (IMAC) research group in the Laboratory of electronic, computing and image (Le2i, CNRS, France).

Research Aims:

- Develop greater understanding of Phase Contrast Magnetic Resonance Imaging (PC MRI) sequences, measurement protocols, and post-processing techniques for the measurement of displacement, flow and pressure drop.
- Attain skills in the manufacture of idealized *in vitro* vascular phantoms.
- Develop skills to conduct *in vitro* fluid dynamics experiments on rigid and compliant vascular phantoms.

#### Key Attributes of Project for Brazilian Postgraduate Students

Galway Mayo Institute of Technology offers abroad range of programmes at undergraduate and post graduate level. In research, it provides opportunities at masters and Ph.D level. The Institute has designated three centres of research. These are:

- Marine and Freshwater Research Centre (MFRC)
- Galway Medical Device Technology Centre (GMedTech)
- Centre for the Integration of Sustainable Energy Technologies (CiSET)

The common theme of our research is that it is **applied** and **close to industry**. As well as the academic impacts, we are extremely focussed on economic and societal impacts of research. Examples include optimisation of product design to improve medical devices, interpreting complex scientific data for informing formulation and implementation of fisheries policy, advising SMEs on integration of energy systems to best suit their needs. Such examples are characterised by applied research, leading edge innovation, closeness to industry and high levels of expertise – all of which are present in GMIT.

This project gives the opportunity to work closely with industry in Ireland, as the research centre has a track record of working with such companies. The centre is housed in an integrated facility and has attained over 2 million in funding since 2006.

Students will work with state-of-the-art equipment in a facility which is at the centre of a cluster of medical device companies and R&D organisations. The centre is internationally recognised among the medical device community for its novel modelling and theoretical work supporting the biomedical sector. This will provide a unique opportunity for a graduate seeking to develop skills in this high-tech and internationalised sector.

#### Name and contact details for project queries, if different from PI named above:

As above.

**Please indicate graduate disciplines which are eligible for application:** Mechanical / biomechanical engineering graduate or equivalent with a H2.2 honours degree minimum.

#### Alignment with Science Without Borders Priority Areas:

Please indicate the specific programme priority area under which the proposed postgraduate project fits – choose only one (tick box)

Engineering and other technological areas	
Pure and Natural Sciences (e.g. mathematics, physics, chemistry)	
Health and Biomedical Sciences	✓
Information and Communication Technologies (ICTs)	
Aerospace	
Pharmaceuticals	
Sustainable Agricultural Production	
Green Chemistry	
Oil, Gas and Coal	
Renewable Energy	

Minerals	
Biotechnology	
Nanotechnology and New Materials	
Climate Change	
Biodiversity and Bioprospection	
Marine Sciences	
Productive Inclusion and Social Technologies	
Housing and Sanitation	