

Institute of Technology
Ciência sem Fronteiras / Science Without Borders
Postgraduate Project Template

Institution:	ITT Dublin
Title of Postgraduate Opportunity: (include level of study)	Bio Prototype Assisted Scoliosis Surgery
PI Name & Contact Details:	Dr Fiona McEvoy 014042735 Department of Mechanical Engineering ITT Dublin Tallaght
Department/School:	Department of Mechanical Engineering
Research Centre /Group:	Bioengineering Technology Centre
Research Centre/Group website:	
<p>Brief Summary of PI research / research group /centre activity</p> <p>The BTC (Bioengineering Technology Centre) was formed in 2008 and has completed 6 major projects, these projects have been supported by consultants in 4 hospitals.</p> <p>In 2009 the centre got funding for an 8 axis material test machine, figure 3 (the only one of its type in Europe). This machine has been designed to be capable of testing spines and hips in fatigue with a full range of motion. This project will build on the expertise developed in the centre, the collaboration with the medical consultants, and the facilities within the centre. To date, the BTC has completed a number of projects on, rehabilitation of the Achilles tendon; helmet design; ankle& hip implant design and testing;.</p> <p>Currently the research is primarily on the spine, focusing on Scoliosis and khyoplasty.</p> <p>Scoliosis is a spinal deformity exhibiting combinations of both lateral bending and torsional effects. Approximately 10% of all adolescents have some degree of scoliosis, and 10% of these have curves which require medical attention beyond monitoring.</p>	
<p>Brief Description of Masters or PhD Project</p> <p>Early stage medical intervention can dramatically reduce the effects of the condition and improve quality of life. The most common surgery is anterior-posterior spinal fusion and the duration time of surgery varies from 2 hours up to 12 hours depending on the severity of the curvature. In order to correct the curvature, screws are attached to both sides of the back of the individual vertebra and this will reshape the spine, with the rods carrying the forces related to the condition.</p> <p>The aim of this research is to optimise the surgical procedure by identifying the significant correction forces for spinal fusion surgery. This will be conducted using the six degree freedom spine simulator from the Bionix Servo Hydraulic Test System machine.</p> <p>This research started with developing a three dimensional diagnosis method for number of different scoliosis conditions. The diagnosis analyse each angle of the vertebrae which related to three references views, which are sagittal (side), coronal (frontal) and axial view.</p> <p>From this diagnosis, the angle can be used as a target to obtain the required forces for correction using the spine simulator. The loading forces for the spine to return back to its normal position from a certain curvature will be the most significant result as it could be correlated with the result from the measurement technique. The results then tested in the Finite Element Analysis (FEA) simulation by</p>	

using ANSYS (simulation software).

Key Attributes of Project for Brazilian Postgraduate Students

Should outline why projects offer something that is not available in Brazil – specific equipment, multi-disciplinarity, aspects of structured programme, links with industry, placements, links with other research groups, etc. Good opportunity for IoTs to emphasise their close working relationships with industry and particularly SMEs and their pivotal role in regional economic development

This proposal seeks to strengthen the research skills of the graduate in line with the Code of Practice for Research Degree programmes for ITT Dublin. Accordingly the following training will be provided to the graduate on a timely basis as needed for the progression of their research;

Institute training: The student will be provided with training within the school and college in accordance with the Institute's code of practice for Research Degree Programmes. Within the first few weeks the student will be given an induction course which involves orientation of the Institute, School of Engineering, Library and Facilities. It will provide core research skills training; including: time management, planning, experimental design and methodology, logbook skills, data presentation, report writing, presentation skills, referencing skills. The student will receive project specific training on the SLS process.

Medical training: the student will be able to attend the fifth year Bio-Engineering module which will provide a foundation in basic anatomy and bio-engineering, and receive training on the MIMICS software for scan conversion. In addition the students will form links with the surgeons and consultants within the hospitals.

Inter-disciplinary communications: As this project deals with medical issues, the student will work with engineers and clinicians from the medical profession, this will assist the student in becoming familiar with interfacing with medical teams, and the terminology required therein.

The student will present papers to local conferences and at least one international conference. A potential conference would be the "International Symposium on Computer Methods in Biomechanics and Biomedical Engineering".

At the end of this project the student will be able to;

- apply project planning and schedule accordingly
- compile a technical literary review
- concert medical scan data into engineering models
- analyse technical data
- prepare reports and technical papers

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

Please indicate graduate disciplines which are eligible for application:

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	<input checked="" type="checkbox"/>
Pure and Natural Sciences (e.g. mathematics, physics, chemistry)	<input type="checkbox"/>
Health and Biomedical Sciences	<input type="checkbox"/>
Information and Communication Technologies (ICTs)	<input type="checkbox"/>
Aerospace	<input type="checkbox"/>
Pharmaceuticals	<input type="checkbox"/>
Sustainable Agricultural Production	<input type="checkbox"/>
Green Chemistry	<input type="checkbox"/>
Oil, Gas and Coal	<input type="checkbox"/>
Renewable Energy	<input type="checkbox"/>
Minerals	<input type="checkbox"/>

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