Sheffield Hallam University

Engineering GTA Studentship Opportunities

The Materials and Engineering Research Institute (MERI) welcome applications for fully funded PhD studentships, to start October 2017.

The full-time PhD project opportunities featured below are Graduate Teaching Assistantships (GTA) offered within the Faculty of Arts, Computing, Engineering & Sciences (ACES). They are open to Home/EU applicants only.

Applicants interested in part-time study may also wish to consider the projects listed here if they plan to apply for one of the part-time (fees only) scholarships. Additional full-time PhD project opportunities in MERI, jointly funded by industry partners, are also available - please see separate MERI listings.

MERI is dedicated to addressing industrial problems through the application of fundamental science and engineering and has a highly successful track record of applying cutting edge research to find innovative solutions to industry problems. In the REF 2014, 56% of the submitted research received the prestigious 4* and 3* rating as world-leading and internationally excellent. Research centres within MERI provide a focus for research in Automation & Robotics, Materials Analysis, Polymers, Nanocomposites & Modelling, Structural Materials & Integrity and Thin Films. You will join a community of Materials and Engineering PhD Researchers who are based in the main university buildings in the centre of Sheffield.

Successful applicants in relevant research areas could also have the opportunity of involvement in the University Alliance Doctoral Training Alliance in Energy.

How to apply

Applicants should email their completed postgraduate application form (including a 1500 word proposal) along with the following documentation to MERI-Student@shu.ac.uk by 12 noon on Friday 24 February 2017:

- 2x references
- copy of degree certificate(s)
- passport/ID card
- evidence of English Language ability if required

When completing the application form, you can develop a research proposal in response to one of the projects listed below OR you have the option of submitting a proposal for your own research idea. In either case, please indicate the appropriate project title and also explain why you are interested in doing PhD research on this topic, how your skills and experience to date (including your undergraduate and/or masters dissertation) prepare you to embark on the project and discuss any challenges that you foresee in conducting the research and how you might approach or solve them.

We strongly recommend that you contact the project lead or a relevant prospective supervisor to discuss and develop your research proposal before submitting your application form.

Where English is not your first language, you must show evidence of English language ability to the following minimum level of proficiency: an overall IELTS score of 7.0 or above, with at least 6.5 in each component or an accepted equivalent. Please note that your test score must be current i.e. within the last two years and that any relevant certificates must be submitted at the point of application.

Please indicate clearly in your email whether you would like to be considered for part-time study (fees only).

For all queries about the application process please email MERI.PGR.administrator@shu.ac.uk

Selection process

Interviews will be held on 24 and 25 April 2017. Shortlisted applicants will be required to give a 10 minute presentation (see below) followed by an interview. Interview panel members include the head of postgraduate research, a prospective director of studies and (for GTA applicants) a representative from the relevant teaching department. Where travel to Sheffield is not possible, interviews are conducted by Skype or conference call.

The presentation should outline your PhD research proposal or a research project you have already undertaken, targeted to a non-expert audience; we want to see how clearly you can articulate your ideas and key concepts. You may use PowerPoint if you wish or other visual aids as appropriate, but this isn't compulsory.

Research areas

1. Composition/Structure/Property relationships in UK and international high-level radioactive waste glasses

Project Lead: Dr Paul Bingham P.A.Bingham@shu.ac.uk with Dr Tony Bell (SHU) and Dr Alex Hannon (Rutherford Appleton Laboratory)

This interdisciplinary PhD project involves collaboration between Sheffield Hallam and the Science and Technology Facilities Council's (STFC) ISIS Facility at the Rutherford Appleton Laboratory. The project will use advanced neutron and X-ray diffraction techniques combined with Empirical Potential Structure Refinement (EPSR) modelling to understand composition/structure/property relationships in UK and international high-level radioactive waste glasses rich in "problematic" waste constituents such as MoO3 and MgO. A primary goal of the project is to develop methodologies to use advanced characterisation and modelling techniques to understand atomic-scale structure of complex radwaste glasses and ultimately support the design of new glasses with enhanced performance.

You will join a vibrant glass research group at Sheffield Hallam and will conduct literature reviews, prepare simulated radioactive waste glasses and conduct characterisation using XRF, XRD, Raman and Mössbauer spectroscopies. You will spend several months based within the Disordered Materials Group at STFC's ISIS facility under the supervision of internationally renowned project partners, receiving training in neutron and X-ray diffraction experimentation and analysis, and EPSR modelling. You will conduct experimental work using the GEM neutron diffraction beamline at ISIS and XPDF beamlines at Diamond Light Source, and will use STFC's advanced computing facilities for glass structure modelling. Further training will be provided through the ISIS residential neutron training course. You will learn within the world-class STFC PhD student cohort; will be enrolled on the STFC postgraduate skills and training courses, short courses and summer schools; and will be involved in public engagement activities.

This project will appeal to any student with an interest in Physics or Materials Science, and in applying their skills to help solve real-world societal and environmental problems.

Essential - a good (1st Class or 2:1) Honours degree or a Master's degree in Physics, Materials Science or Chemistry, and experience in carefully designing and conducting laboratory-based experiments and/or mathematical modelling studies.

Desirable – a demonstrable understanding of diffraction techniques, glass science and chemistry, the nuclear fuel cycle and radioactive waste generation and treatment, and/or modelling of composition/structure/property behavior of materials.

2. “A Study to improve Target Lifetime of the Spallation Neutron Sources at Rutherford Appleton Laboratory”

Project Lead: Dr Buddhadev Jana B.Jana@shu.ac.uk with Dr Karen Vernon-Parry (SHU) and Dr Arghya Dey (STFC)

This is a collaborative project between Sheffield Hallam University (SHU) and the STFC Rutherford Appleton Laboratory (RAL), and it aims to improve the life of the ISIS spallation target material, made of a tantalum cladded tungsten core materials. The tantalum cladding is welded using electron beam (EBW), and the assembly is compacted further using hot isostatic press (HIP). The target receives high energy pluses of proton beam of 800MeV to produce neutrons.

The spallation target often undergoes premature failure contributed by several factors including (1) EBW failure, (2) corrosion (3) thermal fatigue cycle and (4) defects (both materials and manufacturing). This project aims to identify the combined long term effect of these factors on the life time of the Targets. The study will include:

(i) a laboratory based corrosion rig development

(ii) test rig development to simulate heat transfer at Ta-W interface

(iii) materials characterisation using SEM, TEM, AFM etc

(iv) finite element modelling to understand load distribution in the Ta-W interface and the effect of ongoing corrosion of the Target parameters.

This project is vital to minimise operation delays of the STFC’s ISIS facility, which supports more than 3000 national and international scientists interested in materials research using the ISIS's neutron scattering technique.

This project will suit students with a background in Mechanical Engineering, Material science, Metallurgy, Physics or a related discipline.

3. Development of a salt storage mortar where the salts crystallise throughout its pore structure without causing damage to the mortar or the host material, in association with Roman Construction Products Ltd.

Project Lead: Dr Vincenzo Starinieri V.Starinieri@shu.ac.uk with Dr Fin O'Flaherty (SHU) and Prof Pal Mangat (SHU)

Repair mortars to be applied on wet and salt loaded substrates within a historic structure should both be compatible with the original materials and suffer no deterioration following the movement and crystallisation of salts in the mortar. The aim of this project is to develop a salt storage mortar where the salts crystallise throughout its pore structure without causing damage to the mortar or the host material. This is to be achieved by fine tuning of the pore structure of hybrid mortars comprising two very different types of hydraulic binders and at least three admixtures. This project will expand on previous EU funded research and pilot studies and will include extensive experimental work for investigating the influence of different parameters such as aggregate and substrate characteristics on mortar properties. The developed mortars will provide a viable alternative to current repair solutions i.e. hydrophobic render and plaster mortars, which can cause degradation of the treated structure due to low compatibility with the original substrate material. Feedback from end users will be sought through organisations that provide training courses in the use of repair materials in historic buildings, such as the Building Limes Forum, the Institute of Historic Building Conservation and the Society for the Protection of Ancient Buildings.

Students will normally need to hold, or expect to gain, a First or Second Class Honours degree in Materials Science, Engineering, Building, Conservation Science, Architecture, Physics or related discipline. Experience of testing of mortars or concretes, preferably with low energy binders, will be an advantage.

4. Relationships between composition, structure and optical properties of new glasses for solar energy photovoltaic (PV) modules.

Project Lead: Dr Paul Bingham P.A.Bingham@shu.ac.uk with Prof Georges Calas (UPMC) and Dr Tony Bell (SHU)

This interdisciplinary materials/physics PhD project involves collaboration between SHU and Université Pierre et Marie Curie (UPMC), Paris. The project will study the relationships between composition, structure and optical properties of new glasses for solar energy photovoltaic (PV) modules. The aim is to develop understanding of the structural environment of novel 4d and 5d transition metal dopants in oxide glasses, and to thereby generate innovative optical properties. This will offer new glasses with increased UV protection and down-conversion for PV modules, simultaneously extending service lifetimes and increasing solar cell efficiency. This exciting field is a current hot topic in solar energy research and the project will provide high-impact outputs.

You will be part of vibrant glass research groups at both Sheffield Hallam and UPMC, and will carry out data acquisition, interpretation and discussion at both institutes. The institutes have complementary expertise and gather a world-unique set of analytical techniques which include multiple-temperature optical absorption, luminescence, Raman and EPR spectroscopies, high-pressure XRD, XRF, Brillouin and SEM/EDX capabilities, and access to UK and French synchrotron facilities. Through these, you will access a fundamental understanding of the composition-structure factors determining how selected 4d and 5d transition metal ions provide key optical properties of these new glasses. You will be trained in advanced X-ray absorption spectroscopy for glass structure determination at UPMC under the supervision of the world-leading glass scientists. You will receive professional development and public engagement opportunities at both institutes, for example Science Week.

This project will appeal to any student with an interest in Physics or Materials Science, and in applying their skills to help solve real-world societal and environmental problems.

Essential - a good honours degree or Master’s degree in Physics or Materials Science and experience in carefully designing and conducting laboratory-based experiments and/or mathematical modelling studies, together with curiosity and adaptability skills.

Desirable – a demonstrable understanding of glass science and chemistry, optical and structural properties of materials, advanced spectroscopic methods and approaches, and/or determination of composition/structure/property behavior of materials.

5. ‘Double-negative mechanical metamaterials’

Project Lead: Prof Andrew Alderson A.Alderson@shu.ac.uk with Prof Fabrizio Scarpa (University of Bristol) and Prof Martin Wegener (Karlsruhe Institute of Technology)

The proposed project builds on a previous MERI PhD project recently reported in Advanced Materials where we developed a mechanical metamaterial simultaneously displaying negative stiffness (NS) and Poisson’s ratio (NPR), corresponding to a material which becomes shorter, and both longer and thicker, respectively, under lengthwise tension. Each negative property leads to enhanced vibration damping and energy absorption under dynamic loading. The metamaterial comprised an NPR array of interlocking regular hexagon subunits with NS elements (foam, buckled beam or magnetic assembly) embedded within the interlocks. We aim to develop the metamaterial further and to demonstrate it exhibits improved vibration damping over either of the unusual properties in isolation. The objectives are:

- To establish anisotropic response through subunit shape
- To extend to 3D
- To establish hierarchical (multi-level) responses
- To scale down to microscale
- To assess vibration damping

The project lead has a strong public engagement track record (BBC TV/radio, Science Festivals, Science Museum) and has engaged The Conversation for the initial development.

You will enjoy working with prestigious collaborating partners and have a background in the physical sciences, preferably in materials engineering and mechanical properties. Experience in any or all of the combination of CAD, materials modelling (Finite Element Analysis), fabrication (laser cutting, 3D printing, microfabrication methods) and characterisation (mechanical properties, vibration damping) will be advantageous.

6. "Inverse multiple relaxation time (MRT) formulation" LB models, which provide dramatic (but essential) increase in computational stability, in association with University of Sheffield Medical School

Project Lead: Dr Ian Halliday I.Halliday@shu.ac.uk with Dr. Xu Xu (SHU), Dr Torsten Schenkel (SHU) and Dr M A Seaton (Daresbury Lab)

Recent work incorporating meso-scale biological membrane physics into computational fluid dynamics (lattice Boltzmann equation = "LB" technique) will be

(i) extended from two to three dimensions

(ii) optimised for stability

(iii) incorporated within the sustainable, parallel-optimised computational platform of Daresbury Laboratory's DL-MESO code (which already includes/disseminates SHU-developed critical methodologies

(iv) applied to begin to determine an emergent rheology of blood based on first-principles and basic science

The work in (i), (iv) comprises the project's novel, applied mathematical content. (i) is supported by SHU researchers Halliday and Xu, who will generalize recent methodologies to 3D, developing theoretical extensions necessitated by the increase in membrane flow modalities allowed by a release of dimensional constraints. (iv) will be supported by Seaton, (whose expertise will provide project significant mitigation [5]) Schenkel and Halliday. The essential "multi-scale" rheology modelling within (iv) has unlimited potential impacts and the wider, traditional CFD community.

The work in (ii) will utilise recently developed results and exploratory 3D extensions of recent, innovative "inverse multiple relaxation time (MRT) formulation" LB models, which provide dramatic (but essential) increase in computational stability.

The work in objectives (ii) and (iii) involves collaboration with the University of Sheffield Medical School to explore the benefits of modelling membrane dynamics at the mesoscale between atomistic and continuum length and timescales.

Student should have excellent mathematical skills and computational skills. This project is suitable for a person with a first degree in mathematics, physics, computing or engineering.

7. Classification of biomechanical characteristics associated with the development of elite Olympic weightlifters, in association with British Weight Lifting

Project Lead: Dr Lylah Haynes L.Haynes@shu.ac.uk with Dr John Kelley (CSER – HWB) and Tim Vernon (CSES - HWB)

This research will be conducted within the framework of an interdisciplinary collaboration between the faculties of ACES and HWB, with support from British Weight Lifting. This provides a unique opportunity to develop mathematical models of weight lifting, in combination with experimental studies, for enhancing performance of elite weightlifters. Through use of force profiling, anthropometric measurements and 3D motion analysis, this project will

1. investigate key biomechanical predictors of performance in weightlifting
2. develop a profiling tool for identification of elite weightlifters
3. optimise training techniques for weightlifters based on physical characteristics

It is anticipated that results will be used to design individualised training programmes to prepare Olympic athletes, and to develop a consultancy tool for use by weightlifters seeking improvements in performance. The broader applications of the findings will be managing injury risk and improving rehabilitation training. With increasing members of the public involved in strength sports, and the implications of resistance training in health, including the positive effects of reducing sarcopenia in the elderly, an understanding of performance and injury will have a wider impact in the public domain.

The project is best suited to students with a BSc/MSc Mathematics, Engineering or Physics, or an MSc Sport and Exercise Science with an emphasis on Biomechanics.

8. Characterisation of Endothelial Wall Shear Stress (WSS) distribution using optical measurement methods, in association with University of Sheffield Medical School

Project Lead: Dr Torsten Schenkel T.Schenkel@shu.ac.uk with Dr D Asquith (SHU) and Prof Andrew Alderson (SHU)

The proposed project addresses one of the key contributions to a wide range of pathologies in cardiovascular disease: The temporal development of WSS and its effect on strain in the endothelial layer.

Complementary to numerical simulations, an experimental study will develop phantom geometries and combine modern optical measurement methods (Particle Image Velocimetry, PIV and Digital Image Correlation, DIC) into a novel unified validated framework.

Phantom geometries for validation studies will be developed based on typical pathologies identified by the biological partners in the project (Evans et al.), ranging from simple generic shapes, like u-bends and branches to subject specific geometries, like the aorta, arterial branches and venous grafts, measured using MRI. Stereo PIV will be used to measure the flow velocity profile normal to the wall in the phantom geometries using a non-Newtonian optically transparent model fluid. The strain measurement method will be performed on a silicone based phantom material with the goal to transfer it to cultured endothelial cell layers on a substrate.

The results of the project will provide new insights into the development of WSS and the effect on the endothelial, which will inform new work on the prevention of atherosclerosis as the main contributor to heart attacks.

Located in MERI, the numerical side of the study will benefit from the recently upgraded Beowulf cluster, while the experimental side will fit into the new Experimental Continuum Mechanics (ECM) facility, which will provide access to the optical measurement systems.

The ideal student for this project will have a background in Mechanical, Aerospace or Chemical Engineering, while looking for an interdisciplinary challenge. Experimental experience is an advantage. You will be expected to learn to use commercial and in-house numerical tools in collaboration with the supervisory team. You will work between a variety of disciplines and broaden horizons based on a widespread interest beyond engineering.

9. Development of sub-scale fracture testing for in-service performance predictions

Project Lead: Dr David Asquith D.Asquith@shu.ac.uk with Prof Alan Smith (SHU), in association with The University of Sheffield Culham Centre for Fusion Energy

As predictive models of nuclear reactor core materials improve the need to characterise behaviour of specimens of near microscopic scale increases. Irradiated specimens are inevitably small and rare, their mechanical behaviour is known to differ from virgin material but characterisation is difficult. Development of subscale test methods in SHU may provide a tangible approach to test such materials and provide critical insight to the structural performance of in-service core materials. In addition to immediate applications in nuclear core materials there is a wider value to the pressure vessel and pipeline industry in being able to accurately capture behaviour from a small core-drilled specimen from in-service structures.

This project will focus on the development of a novel experimental approach using non-contacting techniques both optical and electron-optical methods to measure fracture parameters in sub and micro scale specimens i.e. transition and plane stress geometries. These will be carefully compared to standard geometries and validated through simulation driven from the new geometries. A final objective will be to measure parameters from an irradiated specimen and propose a detailed validation experiment on up-scaled material.

The recently funded Experimental Continuum Mechanics (ECM) facility provides a base for this research and the support of a growing experimental/numerical community will be an excellent support network.

This project is ideally suited to a student with strong capabilities in mechanics and good mathematical and computing skills. Mechanical and Aerospace engineers will be well suited, but also more practical mathematicians and physicists. A good breadth of both practical engineering, designing making and testing along with experience of novel experimental techniques, preferably optics will be required. The complex mathematical nature of crack tip behaviour means that a good grasp of maths and related modelling software such as matlab will be required. You will need to be motivated by and engaged with the engineering science community to stay in touch with latest developments and disseminate their exciting work.

10. Performance Enhancement of Flow Control Technologies through Application of High Strain High Temperature Lead Free Piezoceramic Materials

Project Lead: Dr Jonathan Potts J.R.Potts@shu.ac.uk with Dr Antonio Feteira (SHU)

Recent reports of exceptionally high strain properties from new piezoceramic materials developed for high temperature environments have multiple applications within the aerospace industry. This research seeks the exploitation of these new materials for specific use as actuators for flow control applications through small then large scale demonstration through wind tunnel test, in collaboration with ILOT. Firstly, to push the prior art performance envelope of active oscillatory diaphragm based boundary layer devices and secondly, to develop adaptive geometry actuation systems for high temperature hot gas jet engine applications.

Active flow control actuators typically incorporate a thin piezoceramic layer adhered to a metal substrate to drive a diaphragm at resonance or adapt the device morphology, thus producing useful fluidic outputs.

The current technology is limited by the yield stress and depolarisation temperature of the piezoceramic, which can fracture under high bending moments and become inactive at moderate temperatures. New generation piezoceramic materials report exceptionally high strains at reasonably high temperatures, which would be ideal for improved performance of flow control actuators. The project seeks to fabricate bespoke piezoceramic actuators to investigate the application of these materials for multiple flow control methodologies and characterise their performance.

An aerospace background would be a distinct advantage as would experience of experimental and/or computational aerodynamics. You should be self-motivated, have good communication skills for regular interaction with other stakeholders and have an interest for industrial research.

You should be excited by the prospect of multi-disciplinary research. The supervisory team will provide a student from an aerospace background, with suitable training, to conduct careful laboratory materials testing to cycle new state of the art piezoceramic compounds through to the point of actuator fabrication. It could also be possible for highly motivated materials candidate with experience in the laboratory to make the bridge across to aero-mechanical testing with the training and experience provided by the supervisory team.

Although some research experience would be beneficial, the supervisory team are happy to provide suitable training where the candidate meets the academic requirements and demonstrate a willingness to learn and work closely with the team.

11. Wireless Acoustic Laryngeal Examination System Design for Non-invasive Diagnosis of Paradoxical Vocal Cord Dysfunction, in collaboration with Sheffield Children's Hospital

Project Lead: Dr Reza Saatchi R.Saatchi@shu.ac.uk with Dr Nicki Barker (SCH) and Prof Heather Elphick (SCH)

In paradoxical vocal cord dysfunction (pVCD), the timing of the vocal cords becomes disordered leading to feelings of shortness of breath. The condition is currently diagnosed by placing a camera up the nose whilst the person is exercising. This operation is invasive and difficult for children to tolerate. In this research we will develop a novel electronic neckband that provides a non-invasive method for diagnosing pVCD by wirelessly recording and analysing the sounds around the throat.

The aim is to develop a new, non-invasive wireless method of diagnosing pVCD using respiratory sound analysis. The main output is to create novel findings and knowledge through scientific research that can be published in high impact journals. The work has the potential to significantly improve patient care, particularly in children. Our links with the medical sector and industry will facilitate commercialisation.

A focus group will be formed to input public view into the study. The work will be showcased through online platforms, MEDIPEX, in seminars and open days.

The development work will be carried out at Sheffield Hallam University in collaboration with our medical partners at Sheffield Children's Hospital. There will be appropriate training in medical electronic system design, ethics, scientific trials, data analysis and product commercialisation.

The primary subject expertise needed is electronics but other related subjects are applicable. The work requires electronic system design and so good theoretical and practical electronic knowledge are needed. You should be highly motivated, keen on research and be able to develop innovative publishable solutions. Ability to deal with challenging design problems, scientific approach to investigations and communication, careful documentation and meeting targets within deadlines are important. As this is a multidisciplinary research, the ability to learn and apply new concepts and to record data (working with children) in medical environments safely is necessary. An ability to work effectively as part of a team and individually is essential.

12. Investigating model predictive control and optimization methods and their applications in Battery Energy Storage System (BESS)

Project Lead: Dr Hongwei Zhang H.Zhang@shu.ac.uk with Dr Walid Issa (SHU) and Dr Nan Jia (JWEPANDA)

In 2015, renewable energy produced by natural fuel sources such as solar, wind, marine, hydro and biomass accounted for more than 20% of the UK's electricity and the target for 2020 is 30%. With the Climate Change Act mandating carbon emissions cuts of 80% by 2050, renewable energy will continue to be an important strategy. More and more renewable energy being integrated into the national grid would mean different power sources with various properties and magnitudes (ac or dc, different voltages, different currents and time variant frequencies, etc.) will be utilized to support the grid and this must be implemented in a smart way.

One of the solutions is the smart grid or micro-grid which is a gathering of different energy sources being managed as one body. This presents a significant challenge for the Energy Management System (EMS) that needs to decide which energy is used or combined and what amount must be stored on short term and long term so that it satisfies the demand and optimises the storage. Because the inputs and outputs to the grid are stochastic and time variant rather than stable and predictable, it calls for new control strategies that integrates flexible demand and efficiently balances production and consumption of energy.

With the ever-falling price of lithium-ion technology, Battery Energy Storage System (BESS) has been accelerating in growth, much like solar has done historically. Developers are looking to install systems in line with Enhanced Frequency Response (EFR) regulation. Bilin Power Technology Ltd in China (BPT) and its UK subsidiary JWEPANDA Ltd (JWE) are BESS solution providers. Their main business focus is integration of battery energy storage with renewable energy for enhanced frequency service, load balance, time shifting and stabilising the grid.

Working with BPT/JWE, the proposed PhD research will focus on investigating model predictive control and optimisation methods and their applications in BESS on the following three stages: Active Load Management (ALM), Contract Service Management (CSM) and Capacity Trading Management (CTM).

13. Oxide based functional thin film materials used in semiconductor manufacturing, solar cells, display and glazing industry as semiconductors and insulators for microelectronic components, transparent conductors for displays and solar cells and corrosion barriers for architectural glass coatings

Project lead: Prof. Arutiun P. Ehiasarian a.ehiasarian@shu.ac.uk with Dr Ralf Bandorf (Fraunhofer IST) and Dr. Volker Sittinger (Fraunhofer IST)

Oxide based functional thin film materials are used in semiconductor manufacturing, solar cells, display and glazing industry as semiconductors and insulators for microelectronic components, transparent conductors for displays and solar cells and corrosion barriers for architectural glass coatings. There is an increasing demand on materials performance which can only be achieved by improving the microstructure and the method of production. The project aims to develop high performance functional materials by exploiting a new production technology called high power impulse magnetron sputtering (HIPIMS). HIPIMS has an unparalleled capability to tailor microstructure and texture of thin films and has broken many barriers to implementation in other fields. This project will exploit pioneering equipment and methods to perform an in-depth study of HIPIMS-of-oxides plasmas and the microstructure and texture of the resulting films. It will be based at the National HIPIMS Technology Centre-UK and utilise the 2D Coater, latest generation of HIPIMS power supplies and the full plasma analytical suite. It will make use of MERI's central facilities for SEM, XRD, TEM and SNMS. Sample analysis including EPMA, ellipsometry, conductivity, stress will be performed at Fraunhofer IST in Germany. The project findings have good prospects for upscaling and implementation in industry. The student will be located at Sheffield Hallam University and have the opportunity to travel to the Fraunhofer Institute for Surface Engineering in

Braunschweig, Germany. The Sheffield Hallam University - Fraunhofer IST HIPIMS Research Centre was established in 2006 and has run several successful research projects funded by EPSRC and industrial partners. It is also organising the International Conference on HIPIMS. There will be two co-supervisors from their team appointed to the project. Their experience with functional oxide coating deposition and HIPIMS as well as knowledge of the latest market trends will be invaluable in guiding the project. Usage of their materials analysis facilities will ensure that coatings are evaluated to a world standard which is trusted by researchers and industrialists. Their large scale machines would provide the ideal opportunity to upscale the technology and create a path to industrialisation. The Fraunhofer IST ranks amongst the top in the world for links with the coating industry.

This research project will appeal to an ambitious student with a background in physics, materials science, chemistry or materials engineering, who is keen to learn about materials synthesis, materials properties and plasma deposition. Training will be given in materials science, thin film growth, and plasma technology.

14. Innovative Robotic Solutions for Service Tasks

Project Lead: Dr. Giuseppe Carbone g.carbone@shu.ac.uk, with Dr. Alessandro Di Nuovo (SHU), Prof. Jacques Penders (SHU), and Prof. Marco Ceccarelli (IFToMM World President and Head of Laboratory of Robotics and Mechatronics, University of Cassino, Italy) and DR. Jackie Hammerton (Physiotherapy lead, SHU)

This interdisciplinary PhD project involves collaboration between Sheffield Hallam University and leading research partners such as Laboratory of Robotics and Mechatronics (LARM), University of Cassino, Italy. This project is in the area of design of innovative robotic solutions for service robotics tasks. In particular, the project aims to exploit robotics to provide access to high quality, personalized, remote disease management and rehabilitation for post-stroke patients. Your research will be anchored in engineering design or computing/IT and will benefit from collaboration with physiotherapy professionals in the Faculty of Health and Wellbeing at Sheffield Hallam, to support understanding of the relevant contexts of application. The device will have specific innovative features such as the implementation of a modular, cable-driven parallel robotic architecture. Your research will involve identification of the main features, challenges and constraints implicated in developing and testing a specific optimal design procedure together with specific models and simulations. A successful candidate will have the unique opportunity to receive training and support for working across interdisciplinary aspects ranging from engineering design to IT, hardware/software/test rig development, biomechanics, control, cognitive models, computer science and human-robot interaction. He/she will also have the opportunity to be involved in established national and international research collaborations with leading institutions, including the LARM, University of Cassino, Italy. This research opportunity will appeal to you if you have an interest in robotics and in applying your skills to help solve real-world societal and environmental problems. You will have a good honours degree and ideally a masters degree in a robotics related discipline (preferably mechanical engineering, control engineering or computer science) and some experience in carefully designing and conducting laboratory-based experiments and/or mathematical modelling studies. An understanding of mechanism design and a background in CAD Modelling, control hardware and software would be desirable.