Wolfson School of Mechanical, Electrical and Manufacturing Engineering

Loughborough University

Research Associate – Digital Validation of Engineered Porous structures

Job Ref: REQ260648

The Wolfson School of Mechanical, Electrical and Manufacturing is one of the leading Engineering Schools in the country. With a strong tradition in Manufacturing and in the discovery and application of Materials for applications in a broad range of industrial sectors (e.g., electronics, bioengineering & healthcare, automotive, food industry, etc), we strive for academic excellence and research at the leading edge.

Project Description

The project involves the functional modelling of porous structures and foams that have been manufactured using Advanced Manufacturing techniques using metallic, ceramic, polymeric materials or composites. The modelling will inform design decisions for the optimisation of subsequent iterations in the design, manufacture and post-treatment. Functional modelling is the in silico testing (i.e. digital validation) for the assessment of mechanical performance, fluid mechanics properties (e.g., permeability) and chemical reactions, necessary to accelerate the innovation cycle and reduce wastage. We are looking for an engineer or scientist who has experience in the use of engineering analysis software, specifically mechanical finite element analysis, computational fluid dynamics and/or Multiphysics software (esp. COMSOL).

The work will include simulation, validation and verification of products and processes, exploring the concepts of 'Smart testing' via in-silico approaches confirmed by ex-silico/experimental results; design of experiments, data harvesting, collation, analysis and interpretation to derive insight and guide engineering design; communicating research results and outputs to a scientific audience as well as the general public

Key Requirements:

- Experience of deriving experimental designs and protocols in a simulation environment; formal requirements capture
- Experience of performing simulations that include mechanical behaviours (incl. fatigue) and flow (i.e. CFD).
- Experience handling 3D volumetric reconstructions and software for analysis of those
- Experience with COMSOL Multiphysics or similar simulators/software
- Demonstrate excellent communication and interpersonal skills
- Demonstrate excellent self-management and organisational skills as well a committed approach to work
- Willing to work as part of a team and proven performance in a collaborative environment
- Demonstrated ability to write scientific reports, manuscripts and deliver presentations to a specialist audience.

Job Description

Job Grade: Specialist and Supporting Academic Grade 6

Job Purpose

To conduct research in the areas of the of modelling of engineered porous structures manufactured using Advanced Manufacturing techniques to inform downstream decisions before the design is realised. In silico testing for the assessment of mechanical performance (incl. fatigue) and permeability (flow) are the priority phenomena to be explored, but time permitting this may be extended to chemical reactions for the purpose of feeding back to the design stage what are the optimum features and characteristics of the porous structures and their materials. Use of Engineering Analysis software (e.g. FEA), Multiphysics simulators (such as COMSOL) or other CFD software and CAD packages will be used to carry out these studies.

Job Duties

- To conduct research of academic rigour and scientific standard, carry out authoritative literature reviews, and publish in top quality journals, consistent with the School's and Research Lab's quality and ambition.
- To work as part of a multi-disciplinary team that addresses different aspects of the design, manufacture and testing of the porous structures.
- To develop experimental protocols (i.e., 'Design of Experiments') and implement those to obtain meaningful results
- To create CAD models, manipulate them in a cyber space and analyse them using specialist software.
- To create simulations in an engineering analysis or multiphysics solver environment using COMSOL or similar to assess permeability and fatigue properties.
- To lead in the data gathering and analysis thereof using tools such as MatLab, Origin, GraphPad, etc
- To synthesise and interpret data, to present results and conclusions in a rigorous but succinct manner
- To assist the academic staff in the project team with the supervision of undergraduate, MSc and PhD project work and day-to-day supervision and support of other researchers.
- Write up regular progress reports and present outcomes to all Investigators and Collaborators (incl. those located at other Institutions), making recommendations for next steps.
- To support the project team by enhancing relationships with existing collaborators and by assisting the establishment of relationships with new collaborators.
- Travel to external partners and collaborators to undertake experimental trials, attend meetings and make presentations, when required.
- To attend and contribute to conferences, seminars, webinars and other events of interest to the team.
- To contribute to project promotion and public engagement events.
- To contribute ideas for new research and impact directions.
- To always maintain confidentiality and ensure that intellectual property (IPR) generation is safeguarded, and agreements are not violated.
- When appropriate, to deliver teaching, tutorials and laboratory sessions to students, in support of the Teaching & Learning environment in the School.
- To engage in training programmes in the University (or elsewhere) that are consistent with the needs and aspirations of the project and those of the Lab.
- To undertake other duties as may be reasonably requested and that are commensurate with the nature and grade of the post.

Points To Note

The purpose of this job description is to indicate the general level of duties and responsibility of the post. The detailed duties may vary from time to time without changing the general character or level of responsibility entailed. Training will be provided as necessary and in support of the Researchers' professional development, and an attitude for learning will be an essential criterion in the selection of a successful candidate.

Organisational Responsibility

Reports to Prof Paul P. Conway and Prof Carmen Torres-Sanchez, Principal Investigators.

Person Specification

Your application will be reviewed with respect to meeting the essential and desirable criteria listed below.

Applicants are strongly advised to explicitly state and evidence how they meet each of the essential (and desirable) criteria in their application, giving examples of recent experience. You may use the **STAR** approach: explain what the **S**ituation was, which **T**ask you had to do or were allocated, what **A**ction you took, what you did and a justification, and what was the **R**esult. It is highly recommended that the candidates express in their Cover Letter how they fit to the Job Purpose and Job Duties described above. Stages of assessment are as follows:

1 – Application
2 – Test/Presentation
3 – Interview

Essential Criteria

	Criteria	**Stage**
Experience	Experience within a high-quality research or development environment	1, 3
	Authoring original work for academic journal papers, conference papers or technical reports	1
	Using own initiative to identify areas for research, developing new simulation approaches based on the underpinning physics	1, 3
	Competence in Multiphysics or other Digital representations of physical phenomena (e.g., COMSOL, Siemens NX, ABAQUS, CFX, ANSYS, etc.)	1, 3
	Experience in the use of software to visualise and characterise/quantify 3D volumetric models (i.e. CAD packages and Analysis software eg Avizo, VG Studio, Dragonfly, Simpleware, etc)	1, 2, 3
	Experience creating DoEs (design of experiments) developed from the understanding of the physics behind the phenomena	1, 3
	Demonstrated excellent communication and interpersonal skills	1, 3
	Demonstrated excellent self-management and organisational skills, as well a committed approach to work	1, 3
	Experience in use of simulation environments to simulate flow through structures	1, 3
	Experience in use of simulation environments to simulate fatigue properties of structures	1, 3
Skills and abilities	Ability to organise resources to support and further own research activities within the scope of their work	1, 3
	Ability to plan own workload in accordance with the overall project objectives and work independently to meet deadlines	2, 3
	Excellent written and oral communication skills in English	1, 2, 3
	Excellent interpersonal and organisational skills	1, 3
	Working knowledge of data analysis software packages (e.g., MatLab, Origin, Excel, Tableau, etc)	1, 3
	Ability to write project reports and make technical presentations to industrial and academic research groups	1, 3
Training	Evidence of having undertaken further training and a willingness to be trained if necessary to fulfil the requirements of the job	1, 3
Qualifications	A PhD degree in a related subjects (Science, Engineering) or equivalent industrial experience	1
Other	Commitment to observing the University's Equal Opportunities policy at all times.	3

Desirable Criteria

Area	Criteria	Stage
Experience	Involvement in or having worked across different projects, demonstrating an ability to manage own time and competing priorities	1, 3
	Dealing with problems which may affect the achievement of research objectives and deadlines	3
	Experience working with porous structures, foams and their in silico testing	1, 3
Skills and abilities	A self-starter who can operate effectively with minimal supervision, liaising with members of the team on own initiative	3
	Presentation skills of technical and non-technical aspects of the project to various audiences (i.e. academic and industrial collaborators, and general public dissemination of results and impact)	1,3
Other	Able to travel to academic and industrial collaborators' sites	1, 3

Conditions of Service

The appointment will be subject to the University's Terms and Conditions of Employment relevant to the job grade.

Shared University Responsibilities

As a member of the Loughborough community, you are expected to:

- Take reasonable care of yourself, others and the environment, and to prevent harm by your acts or omissions. All staff are therefore required to adhere to the University's Health, Safety and Environmental Sustainability Policies & Procedures.
- Support and contribute to the University's commitment to Equity, Diversity, and Inclusion (EDI), while carrying out all duties in a way that respects these principles and upholds the right to free expression. Further information about EDI at Loughborough and our strategic aims is available on our website

Our Purpose, Vision, and Values

Our purpose, Vision and Values underpin all that we do and shape how we work together at Loughborough.

We're proud to promote our values: **Adventurous**, **Collaborative**, **Creative**, **Authentic** and **Responsible**. Our people bring these values to life every day, and they are central to the positive and supportive culture that makes Loughborough unique.

If you join us, you'll be encouraged to bring these values to life in your own work and contribute to the positive, supportive culture that makes Loughborough unique.

Read more about our **vision and values**.

Our Accreditations

Athena SWAN Bronze Award

We strive to create a culture that supports equality and celebrates diversity throughout the campus. The University holds a Bronze Athena SWAN award which recognises the importance of support for women at all stages of their academic career.

We are proud to be a Race Equality Charter Member. The Charter aims to improve the representation, progression and success of all minority ethnic staff and students within higher education and address issues of racism within higher education institutions (HEIs).

We are proud to be a Disability Confident Employer and have adopted a proactive approach to employing disabled people and to creating a more diverse workforce. We ensure that our recruitment processes are inclusive and accessible. We guarantee to offer an interview to all applicants who have declared themselves with a disability, provided they meet the essential criteria for a role. We proactively anticipate and provide reasonable adjustments and support existing employees who acquire a disability or long-term condition to thrive in the workplace.

We are a real living wage employer, and our Living Wage Employer Mark shows our commitment to paying our staff according to the cost of living.

We are proud supporters of the City of Sanctuary movement and delighted to be recognised as a University of Sanctuary. This national network brings together, university staff, lecturers, academics and students, who together work to make Higher Education institutions place of safety, solidarity and empowerment for people seeking sanctuary.

As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.