Loughborough University

Research Associate in manufacturing using Hybrid 3D Concrete Printing

REQ211422

As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.

School/Department summary

Research and teaching in the School of Architecture Building and Civil Engineering (ABCE) is driven by 63 academic staff, 34 technical and clerical support staff, 40 contract researchers and over 120 doctoral students. The School benefits by having academic staff from a wide variety of backgrounds, with a resulting rich diversity of perspectives.

The undergraduate programmes include Architecture, Civil Engineering, Construction Engineering Management, Commercial Management and Quantity Surveying, Architectural Engineering and Design Management, Air Transport Management, and Transport and Business Management.

At MRes level we train the next generation of multi-disciplinary researchers in energy demand. At MSc level, we offer programmes in Low Energy Building Services Engineering and Low Carbon Building Design as well as in Water and Waste Engineering, Construction Management, Transport Policy and Business Management. These programmes are all accredited by the Professional Institutions. The EPSRC Centre for Doctoral Training in Energy Demand will support over 50 PhD students.

In all courses the academic content is directly aligned to the needs of the industry and there is a high level of sponsorship in our portfolio of programmes. Our record of graduate employment is second to none and we have been ranked 1st or 2nd in the National Student Survey for the last 6 years.

Further information may be found from - http://www.lboro.ac.uk/departments/civil-building/

In the 2014 Research Excellence Framework, the School was ranked fifth in the Architecture and Built Environment Unit of Assessment with 87% of the work judged as either "world leading" or "internationally excellent". Importantly, this was achieved whilst still returning 100% of staff; world class research pervades the School. The research environment was ranked first overall; Loughborough is the best place in which to build a career in energy research.

The international standing of our research is exemplified by our growing portfolio of collaborations with other leading universities and research institutes worldwide. These include: the UNSW Sydney, University of California at Berkeley, MIT, Chongqing, Hong Kong, Iowa State, Oklahoma State, RMIT, Georgia State and Penn State.

For more on our research go to: https://www.lboro.ac.uk/departments/abce/research/

The Concrete Printing Group

Loughborough University is known worldwide for its pioneering work in [3D Concrete printing](#). It was the first to produce large-scale reinforced parts and double-curved panels in additional to the seminal materials research in the area.

3D concrete printing is a large-scale, additive-manufacturing process that can be deployed to deliver functional parts and elements for buildings and the built environment. There is significant interest in these automation technologies worldwide, demonstrated by the many organisations engaged with commercial R & D as well as academic research.

The process has many advantages, including freedom from the need to create moulds, removal of operatives from harmful environments and reduced lead time for part manufacture. It enables greater productivity and greater flexibility of part geometry. The process is implemented through a digital workflow, which allows greater use of modelling and optimisation and more reliable process planning. All of these gains align with the aspirations of Industry 4.0 and the UK's Industrial Strategy for transforming the construction sector.

Hybrid Concrete Printing uses other techniques such as milling in combination with concrete printing and the group has been able to extend the current research project until Summer 2023.

This position will be a key role in exploring new research at the cutting edge of this emerging technology and the candidate will be positioned with CAD/CAM, materials science, structural engineering, metrology and quality control, industrial robotics and automation, and technical support across these disciplines.

Job Description: Automation, tooling and control for 3D concrete printing and hybrid processes

Job Grade: Specialist and Supporting Academic 6

Job Purpose
The Research Associate will be responsible for leading the investigation to develop a parametric production model for the application of milling of green cement-based mortars.

Job Duties
Research
- To develop implement and test process cutting, calibration and finishing of surfaces; and implementing for cement-based mortars
- To develop accompanying digital tools, macros and software codes to drive and demonstrate these processes.
- To write research papers suitable for publication in high quality academic journals and for presentation at specialist scientific conferences.
- To report research progress and work with the wider project teams to ensure successful delivery of the proposed research.
- Prepare reports and other documents to document implemented processes.
- To attend and contribute to project meetings and engagement events.

Teaching
- To assist the academic staff at Loughborough with the supervision of undergraduate MSc and PhD project work and day-to-day supervision and support of other researchers.
- Where appropriate, to deliver lectures, tutorials and laboratory sessions to students.

General and administrative
- To work effectively with relevant administrative, technical and academic staff in the School and across the University.
- To engage in training programmes in the University (e.g. through Staff Development) which are consistent with your needs and aspirations and those of the project team and the host School.
- To carry out specific other duties as may be reasonably requested by the project leaders 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.

Special Conditions
All staff have a statutory responsibility to take reasonable care of themselves, others and the environment and to prevent harm by their acts or omissions. All staff are therefore required to adhere to the University's Health, Safety and Environmental Policy & Procedures.

All staff should hold a duty and commitment to observing the University's Equality & Diversity policy and procedures at all times. Duties must be carried out in accordance with relevant Equality & Diversity legislation and University policies/procedures.

Successful completion of probation will be dependent on attendance at the University's mandatory courses which include Respecting Diversity and, where appropriate, Recruitment and Selection.

Organisational Responsibility
Reports to: Richard Buswell

Person Specification

Your application will be reviewed with respect to meeting the essential and desirable criteria listed below.
Your application will be reviewed against 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. Stages of assessment are as follows:

1 – Application
2 – Test/Assessment Centre/Presentation
3 – Interview

Essential Criteria

Area	Criteria	Stage
Experience	Research or Industrial experience in mechanical and manufacturing engineering, or in construction automation or robotics in architecture, or other similar and relevant area	1,3
Skills and abilities	Ability to undertake the duties and responsibilities of the post	1,3
	Ability to program for the creation of digital workflow for manufacturing processes and in particular implementing CAD/CAM/CNC and control of robitics	1,3
	Ability to efficiently work with materials that might be new to you and developing processes that work	1,3
	Excellent written and oral communication skills	1,3
	Excellent interpersonal and organisational skills	1,3
Training	Willingness to undertake appropriate further training and to adopt new procedures as and when required	1
Qualifications	A good mechanical and/or manufacturing undergraduate degree PhD in a related area (or near completion), or equivalent industrial R and D experience	1,3
Other	Commitment to observing the University's Equal Opportunities policy at all times	1
	Willingness to travel	3

Desirable Criteria

Area	Criteria	Stage
Experience	Experience of using large-scale extrusion based additive manufacturing or hybrid processes and/or robotics	1,3
	Developing automated process using robotics and end effector design and control	1,3
	Working with cement pastes or other similar materials	1,3
	Preparing demonstrations of processes	1,3
Skills and abilities	Knowledge of the rheology of pastes or other extrudable materials	1,3
	Coding and development skills in one or more of the following pieces of software: Powermill, Dynamo, Grasshopper, or equivalent	1,3
	Knowledge of metrology and the use and manipulation of creating, handling and analysing point cloud data	1,3
	Ability to work with communities and stakeholders	1,3
Qualifications	PhD in an area related to one of the following: additive manufacturing, digital workflow, design for manufacture, industrial automation and robotics, CNC/adaptive control.	1

Conditions of Service

The position is for a fixed term period until 31st May 2023, available to start as soon as possible. Salary will be within Specialist and Supporting Academic Grade 6 (£31,406 - £40,927) per annum at a starting salary to be confirmed on offer of appointment.

The appointment will be subject to the University's normal Terms and Conditions of Employment for Academic and Related staff details of which can be found here.

The University is committed to enabling staff to maintain a healthy work-home balance and has a number of family-friendly policies which are available at http://www.lboro.ac.uk/services/hr/a-z/family-leave-policy-and-procedure---page.html
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We also offer an on-campus nursery with subsidised places, subsidised places at local holiday clubs and a childcare voucher scheme (further details are available at: http://www.lboro.ac.uk/services/hr/a-z/childcare-information---page.html

In addition, the University is supportive, wherever possible, of flexible working arrangements.
We also 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. For further information on Athena SWAN see http://www.lboro.ac.uk/services/hr/athena-swan/

Applications

The closing date for receipt of applications is **31 January 2022.**