

# Research Associate in additive manufacturing pharmaceuticals Job Ref: REQ250440

As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.

## **Project Description**

3D printing multi-material tablets has the potential to transform pharmaceutical healthcare by allowing clinicians to quickly produce patient-specific treatment plans. This offers the potential to drastically increase patient compliance by replacing complicated combinations of tablets with a single tablet containing multiple drugs. There is also the potential to introduce much more complex treatments that are currently possible, by designing custom time-release properties in a single tablet, with some drugs being released gradually and others being released instantly or at specific times. This project combines experts from multiple institutions across Europe related to material deposition, pharmaceuticals, material formulation and design methods for additive manufacturing.

The role of Loughborough University is to develop the additive manufacturing hardware and to design reconfigurable manufacturing procedures that can guarantee quality. This includes intricate design of the toolpath, to achieve the necessary microscale geometries, as well as hardware and procedures for in-situ inspection and real-time adaptation of the manufacturing process to achieve levels of precision and quality that are impossible with conventional workflows. The research utilises in-house additive manufacturing software ('FullControl'), written by the project lead at Loughborough, Andrew Gleadall, which has been released open source and is used globally for wide-ranging applications. This research will build on an unreleased enhanced version of the software to achieve novel and important outputs that can be easily adopted in clinical settings.

The PERAMEDIC project will address the challenges of custom pharmaceuticals by developing and evaluating materials, hardware, in-process inspection procedures, geometric toolpaths that adapt based on models developed during the project for drug-release profiles. At Loughborough, the research will encompass: CAD/CAM, robotics and automation, structures and materials science, metrology, and quality control.

The project team working alongside Loughborough University includes researchers and companies from Germany, Hungary, Belgium and the UK.

The critical need for intricate microscale geometry, means the additive manufacturing toolpaths will be directly designed in this process, as opposed to automatically generated with generic algorithms that are not aimed at such intricate components. There will be a need to design and integrate different hardware components for a laboratory development system, including 3D printer printheads, inspection microscopes, and powder-deposition heads, and other material/structure characterisation equipment. Alongside the development of laboratory-based hardware, the project will focus on developing new toolpath-design methods, potentially for multi-axis- or robotic- 3D printing and inspection, to allow intricate parts to be produced with guaranteed quality.

The Loughborough team will also support other partners with activities for commercial/clinical translation, material development and characterisation, and end-user engagement. The overall multi-institution project aims to develop a validated full workflow for custom pharmaceutical design, manufacturing and quality control.

## **Job Description**

Job Grade: Specialist and Supporting Academic Grade 6

#### Job Purpose

To lead research into Additive Manufacturing of multi-material pharmaceutical tablets in a multidisciplinary project with several directly involved collaborators.

#### Job Duties

#### Research

- To develop an efficient digital (CAD/CAM) workflow for the manufacture and real-time in-process inspection of pharmaceutical tablets.
- Design pharmaceutical tablet manufacturing procedures, including the intricate geometries that are directly linked to the toolpath, potentially combining CAD with python.
- Understand the limits of commercially available software when used as part of a digital workflow for 3D printing.
- Understand the limits of additive manufacturing systems for intricate constructs and the requirements for a new custom 3D printer
- Verify process performance, using a combination of in-process sensors to capture real-time process specific data.
- To support the measurement of microscale geometry and material composition using in-situ microscopy/scanning systems, and associated software for post processing image data or equivalent.
- To liaise and engage with the project partners and team members based in the UK, Germany, Hungary and Belgium.
- To operate robotic-/multi-axis- systems for the manufacturing and inspection of test parts and other example objects that are necessary in the project.
- To assist in the development, implementation, and test processes for combined 3D printing of polymers, gels and powders.

#### General, technical

- To assist PI and COIs in project management and develop project delivery plan.
- 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.
- Liaise with project partners to communicate results and maintain an effective scope of the project
- 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 Equity & Diversity policy and procedures at all times. Duties must be carried out in accordance with relevant Equity & Diversity legislation and University policies/procedures.

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

#### **Organisational Responsibility**

Reports to Andy Gleadall (Senior Lecturer/Associate Professor)

# **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**

Area	Criteria	Stage
Experience	Additive manufacturing and characterisation/assessment of intricate structures via material extrusion additive manufacturing	1,3
	Design of additive manufacturing toolpaths at the individual-line level (bottom-up; not just the use of slicers)	1,3
	Use of large language models to assist coding	1,3
	Use of git or similar for collaborating research for software/data- processing	1,3
	Writing up research to high academic standards	1,3
	Building/assembling MEAM hardware or equivalent motion systems	1,3
Skills and abilities	Programming and awareness of Arduino, Raspberry Pi or similar controller boards	1,3
	Excellent written and oral communication skills	1,3
	Self-motivated with proven ability to meet deadlines	3
	Excellent interpersonal, and organisational skills	3
	Ability to write project reports and make technical presentations to industrial and academic research groups	1,3
Qualifications	PhD (or near completion)	1
Other	Commitment to observing the University's Equal Opportunities policy at all times.	3

#### **Desirable Criteria**

Area	Criteria	Stage
Experience	Design of toolpaths using FullControl software	1,3
	Experience in structures with 2D or 3D lattice geometry	1,3
	Experience in design of complex 3D structures	1,3
	Experience in multi-material 3D printing	1,3
	Published conference and or journal papers	1,3
Skills and abilities	Ability to use 3D Computer-Aided Design software	1,3
	Knowledge of extrusion additive manufacturing GCode	1,3
	Ability to write macros/scripts/programs to automate data analysis	1,3

## **Conditions of Service**

The position available is FULL TIME and FIXED TERM for 19 months (project end date of 31 January 2027). Salary will be on Specialist and Supporting Academic Research (SSA6) – from £35,116 per annum depending on experience, 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/Operational and Administrative staff, details of which can be found <u>here</u>.

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 <u>here</u>.

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: <u>http://www.lboro.ac.uk/services/hr/a-z/childcare-information---page.html</u>

In addition, the University is supportive, wherever possible, of flexible working arrangements. We also strive to create a culture that supports Equity 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 <u>http://www.lboro.ac.uk/services/hr/athena-swan/</u>