Loughborough
University

Department of Chemical Engineering

Research Associate in Advanced Optimisation and Control of Pharmaceutical Manufacturing Processes
(Fixed Term for 26 months)

Job Ref: **REQ230091**

As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.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

This project is part of a multi-institutional EPSRC programme; Made Smarter Innovation – Digital Medicines Manufacturing Research Centre which involves 3 universities (Strathclyde, Loughborough, and Cambridge) and key industrial players from the pharmaceutical and digital technology sectors. This project will be based in the Department of Chemical Engineering in the School of Aeronautical, Automotive, Chemical and Materials Engineering (AACME). Following a recent £25 million refurbishment, the department houses a range of state-of-the-art laboratory facilities and a modern office environment.

We are committed to achieving equality for all those who learn and work here and providing a diverse and inclusive working environment. We will consider reasonable adjustments commensurate with the project requirements.

Full project details

The overall objective of the Digital Medicines Manufacturing Research Centre is to accelerate the adoption of industrial digital technologies in the pharmaceutical sector to transform medicines development, manufacturing, quality control and supply chain, reduce costs, lead time and wastes and enhance flexibility and resilience. The achievement of these objectives requires the development of data-driven and model-based digital regulatory Quality Control (QC) approaches along with artificial intelligence and model-based real-time optimisation, fault detection and process control which represent the overall deliverables of the Digital QC platform. We are seeking to recruit a talented and enthusiastic Research Associate to conduct research on real-time optimisation and optimal design space exploration along with advanced control and fault detection. The objective is to develop and experimentally validate key industrial digital technologies as part of the Digital QC platform in collaboration with our research and industrial partners, including the Data, Autonomous MicroScale plant, and Supply Chain platforms.

The project is led by Dr Brahim Benyahia. The overall programme is led by Alastair Florence at Strathclyde University.

Job Description

Job Grade: Specialist and Supporting Academic Grade 6

Job Purpose:

The Postdoctoral Research Associate will work as part of the wider Digital Medicines Manufacturing Research Centre to develop and experimentally validate advanced model-based real-time optimisation, control, and fault detection strategies to meet the quality requirements, captured by a quality control digital twin which will be developed by our research group, and demand from a patient-centric supply chain. The Postdoctoral Research Associate will also develop artificial intelligence-based techniques to explore the design spaces and identify robust and optimal operating ranges and optimal dynamic trajectories. The combination of these strategies will ensure just-in-time production, robust quality control, precise trajectory tracking and reliable fault detection and diagnostic for the next generation pharmaceutical plants. The achievement of these objectives requires higher levels of commitment and collaboration with our research team, particularly the postdoctoral Research Associate in Digital Quality Control who will be recruited at the same time, and close interaction with our external research and industrial partners.

Job Duties

Research
- To conduct research on advanced optimisation, control and artificial intelligence.
- To develop discrete element simulations.
- To develop and validate hierarchical optimisation, control, and fault detection and diagnostics strategies
- To build and validate mathematical models and develop soft sensors and state estimators
- To develop robust optimisation and control strategies for pharmaceutical processes
- To enable artificial intelligence-based real-time identification of optimal robust operating ranges and operating trajectories within the design spaces
- To implement global optimisation and advanced model-based control strategies
- To generate, analyse, interpret and present research data
- To work collaboratively with the research team particularly the research associate in process optimisation and control
- To liaise with academic and industrial project partners, and coordinate activities across the research centre

General, technical
- To perform risk assessments, develop method statements and implement safe working practices.
- To manage technical equipment and provide training to other users as required
- To actively engage with industrial and other non-academic stakeholders to determine system requirements and identify and address potential barriers for implementation
- To regularly report research progress to the programme management group through formal and informal reports and communications
- To write research papers suitable for publication in high quality academic journals and for presentation at specialist scientific conferences.
- To supervise student projects in related areas.
- To attend and contribute to project meetings and engagement events.
- To assist in the development of research proposals and grant applications for follow-on project funding.
- General lab organization and coordination

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 the RA's ongoing professional development, and the needs and aspirations of the project team and those of the School.
- To maintain confidentiality where relevant at all times and ensure that intellectual property agreements are not violated.
- 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.
- To support Chemical Engineering teaching delivery as required

- 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 Dr Brahim Benyahia, Department of Chemical Engineering.

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	Experience in modeling and simulations preferably of pharmacutical or chemical processes	1,3
	Relevant experience in conducting original research that can be, or has been published in high quality journals	1,3
	Experience in modelling and simulation preferably for science and engineering applications	1,3
	Relevant experience in an academic research environment or equivalent industrial experience	1,3
	Record of high quality publications or other forms of research outputs.	1,3
	Experience of presenting research findings at all levels, adapted to specific audience needs, ranging from academic experts to general public	1,3
Skills and abilities	Ability to coordinate project activities, manage project tasks, prioritise and meet deadlines	1,3
	Ability to work independently and also as part of a team	1,3
	Excellent written and oral communication skills	1,3
	Excellent interpersonal, and organisational skills	1,3
	Ability to network with other academics and engage with project stakeholders	1,3
	Ability to write project reports and make technical presentations to industrial and academic research groups	1,3
	Skills in finding information in the scientific literature and proposing original ideas	1,3
	Knowledge, awareness and practice of relevant Health & Safety issues	1,3
	Willingness to assist in preparation for meetings	1,3
Training	A willingness to undertake further training as appropriate and to adopt new procedures as and when required	1,3
Qualifications	Have or soon to have a PhD in Process Systems Engineering, Chemical Engineering, Process Control, Applied Mathematics, Computer Science, or related fields.	1
Other	Commitment to observing the University's Equal Opportunities policy at all times.	1,3
	Willingness to Travel	1,3

Desirable Criteria

Area	Criteria	Stage
Experience	Experience in supervising junior members (e.g. PhD, MSc or final year project students)	1,3
	Writing research proposals for funding from internal/external sources	1,3
	Mathematical modelling and simulation of chemical or pharmaceutical processes	1,3
	Dynamic optimisation / Real-time optimisation	1,3
	Model Predictive Control	1,3
	Soft sensors	1,3
	Robust optimisation and control	1,3
	Model-based design of experiments	1,3
	Design space identification / flexibility analysis	1,3
	Artificial intelligence / Machine learning	1,3
	Fault detection and diagnostics	1,3
Skills and abilities	Willingness to work collaboratively with project partners in different locations	1,3
	Authoring original work in the highest quality refereed academic journals or in patent literature	1,3
	Time management and multitasking	1,3

Conditions of Service

The position is FULL TIME and FIXED TERM for 26 months. Salary will be on Specialist and Supporting Academic Research, Grade 6, Salary Band £30,942 - £35,845 per annum,, at a starting salary to be confirmed on offer of appointment.
The appointment will be subject to the University's Terms and Conditions of Employment for STAFF GRADES 1-5/STAFF GRADES 6 AND ABOVE, 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 can be found here.

The University offers a wide range of employee benefits which can be found here.

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/