

Research Associate in Geotechnical Numerical Modelling for Climate-Resilient Earthworks

Job Ref: REQ260777

Loughborough University is an internationally engaged research-intensive university that delivers meaningful impact and keeps students at its heart. We use our distinctive strengths to support, inspire and empower people to achieve extraordinary things.

The **School of Architecture, Building and Civil Engineering (ABCE)** was ranked 2nd (by both GPA and Power) amongst all UK institutions submitting to the Architecture, Built Environment and Planning Unit in REF2021. ABCE's research environment, which supports colleagues to develop and deliver cutting-edge research and innovation, received the highest possible score, with 100% rated world-leading (4*).

ABCE is an integrated Built Environment School delivering degree courses in Civil Engineering, Architectural Engineering, Architecture, Construction Engineering Management, Construction Management and Quantity Surveying, and Urban Planning. Our faculty comprises around 80 academics spanning these disciplines. We strive for academic excellence and provide a research environment where everyone can thrive. Further information is available at: <http://www.lboro.ac.uk/departments/abce/>

Project Description:

[Professor Alister Smith](#) has been awarded a **Network Rail and Arup / Royal Academy of Engineering Research Chair** and is leading a research group comprising nine Doctoral Researchers focused on climate-resilient earthworks. The research aims to: 1) understand weather-driven deterioration and progressive failure processes, 2) assess performance under extreme weather sequences and future climate conditions, and 3) develop intervention strategies that enhance resilience, extend asset life, and reduce lifecycle cost and carbon. The research group will combine laboratory testing of material behaviour, large-scale (~45-tonne samples, 5 m × 3 m × 1.5 m) experiments in the National Engineered Slope Simulator, and improved and validated numerical modelling. The engineering knowledge, predictive monitoring and modelling tools, and intervention strategies will be co-created with Network Rail and Arup and translated into engineering practice.

The **Research Associate in 'Geotechnical Numerical Modelling for Climate-Resilient Earthworks'** will work closely with **Professor Smith** to coordinate the research group and support delivery of the overall research programme. The Research Associate will lead advanced numerical modelling activities, including the development, calibration and validation of numerical modelling frameworks, forensic analyses of historical earthwork failures, assessment of earthwork survivability under extreme weather and future climate scenarios, and evaluation and optimisation of asset intervention strategies.

The Research Associate will also make a major contribution to the dissemination and translation of research outcomes. This includes publishing high-quality journal papers, presenting findings at national and international conferences, and contributing to industry-facing reports and engagement activities. Working closely with Network Rail, Arup and other stakeholders, the Research Associate will be expected to develop and maintain strong collaborative relationships, participate in regular meetings and workshops, and help ensure that research outcomes are translated into practice.

Key Requirements:

- Experience in performing simulations of hydraulic (e.g. rainfall infiltration, seepage, pore pressures) and mechanical (e.g. deformation, stability, failure mechanisms) behaviour using geotechnical numerical analysis packages.
- Experience developing numerical models for geotechnical problems and calibrating and validating them using laboratory and field measurements.

- Strong understanding of unsaturated soil mechanics, constitutive models for soil behaviour, and the impacts of environmental loading on geotechnical assets.
- Excellent communication and interpersonal skills.
- Excellent self-management and organisational skills, together with a committed and proactive approach to work.
- Willingness to work as part of a team, with evidence of effective performance in collaborative research environments.
- Ability to develop and maintain strong collaborative relationships with industry partners and other stakeholders.
- Demonstrated ability to write high-quality journal papers and deliver presentations to academic and industry audiences.

Job Description

Job Family and Grade: Specialist and Supporting Academic Grade 6

Job Purpose:

To conduct high-quality research in geotechnical numerical modelling to support the development of climate-resilient earthwork infrastructure. Working closely with Professor Smith, the postholder will support the delivery of a major research programme funded through a Network Rail and Arup / Royal Academy of Engineering Research Chair, leading the development, calibration and validation of advanced numerical modelling frameworks, forensic analyses of historical earthwork failures, assessment of earthwork performance under extreme weather and future climate scenarios, and evaluation of asset intervention strategies. The postholder will also contribute to the coordination of a growing research group and play a leading role in the dissemination and translation of research outcomes through publications, presentations, stakeholder engagement and collaboration with industry partners.

Job Duties:

- To conduct rigorous high-quality research in the area of climate-resilient earthworks, including the publication of high-quality research outputs.
- To develop, implement, calibrate and validate advanced numerical modelling frameworks to investigate the behaviour and performance of earthworks under environmental loading.
- To undertake analyses of historical earthwork failure records, curate and synthesise information for selected failure cases, and carry out detailed forensic investigations to reconstruct failure processes and mechanisms.
- To use advanced numerical modelling frameworks to investigate earthwork ageing and deterioration, assess performance under extreme weather and future climate scenarios, and evaluate and optimise intervention strategies to enhance resilience while balancing life extension, cost and carbon.
- To contribute to the supervision and support of Doctoral Researchers within the research group.
- To work closely with academic, industrial and other project partners, including Network Rail and Arup, to support project delivery and maximise research impact.
- To develop and maintain effective collaborative relationships with project partners and stakeholders.
- To prepare progress reports, technical reports and other project deliverables, making recommendations for future research and translation activities.
- To attend and contribute to project meetings, workshops, conferences, seminars and other events relevant to the research programme.
- To present research findings to academic, industrial and stakeholder audiences through publications, conference presentations and engagement activities.
- To contribute to the translation of research outcomes into practice through close engagement with industry partners and end users.
- To contribute to the identification and development of new research and funding opportunities aligned with the objectives of the research programme.
- To work effectively with relevant administrative, technical and academic staff within the School and across the University.

- To engage in training programmes within the University (or elsewhere) that are consistent with the needs and aspirations of the postholder, the research programme and the School.
- To undertake other duties as may reasonably be 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 Research Associate's professional development, and an attitude for learning will be an essential criterion in the selection of a successful candidate.

Organisational Responsibility

Reports to Professor Alister Smith

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, providing examples from their recent experience. You may use the **STAR** approach: explain the **S**ituation, **T**ask, **A**ction and **R**esult. It is recommended that applicants demonstrate clearly in their application how their experience, skills and qualifications align with the **Job Purpose** and **Job Duties** described above. Stages of assessment are as follows:

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- 1 – Application
- 2 – Presentation
- 3 – Interview

Essential Criteria

Area	Criteria	Stage
Experience	Background in geotechnical engineering	1
	Experience within a high-quality research environment	1, 3
	Experience authoring original work for academic journal papers, conference papers and/or technical reports	1, 3
	Experience with finite element and/or finite difference continuum solvers for geotechnical numerical analysis (e.g. PLAXIS, FLAC, Abaqus, MIDAS, COMSOL, OpenGeoSys)	1, 2, 3
	Experience developing numerical models for geotechnical problems and calibrating and validating them using laboratory and field measurements	1, 2, 3
	Experience contributing to collaborative research projects involving multiple academic, industry and/or stakeholder partners	1, 3
	Experience presenting research findings to academic and/or industry audiences	1, 2, 3
Skills and abilities	Excellent written and oral communication skills in English	1, 2, 3
	Excellent interpersonal skills	3
	Excellent self-management and organisational skills	3
	Ability to work independently and manage workload effectively to meet project objectives and deadlines	3
	Ability to work effectively with academic colleagues, industry partners and other stakeholders to deliver objectives	1, 3
	Ability to undertake the duties and responsibilities of the post	1, 2, 3
	Strong understanding of unsaturated soil mechanics, constitutive models for soil behaviour, and the impacts of environmental loading on geotechnical assets	1, 2, 3
	Working knowledge of data analysis and visualisation software (e.g. Python, Excel, Origin, MATLAB)	1, 2, 3
Training	Evidence of continuing professional development and a willingness to undertake further training as required to support the objectives of the research programme	1, 3
Qualifications	PhD (or near-completion of a PhD) in Geotechnical Engineering or a closely related field	1
Other	Demonstrate an ability to behave in a way that adheres to equitable and inclusive working practices, while respecting diversity of thought and supporting freedom of speech and expression	3
	Willingness to travel to meetings, workshops, conferences and partner organisations as required	3

	Ability to represent the research group and University professionally when interacting with external organisations and stakeholders	3
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Desirable Criteria

Area	Criteria	Stage
Experience	Experience implementing atmospheric boundary conditions (e.g. rainfall and evapotranspiration) in numerical analyses of unsaturated soils	1, 2, 3
	Experience designing numerical simulation programmes involving large parameter spaces and uncertain parameters, including the use of sensitivity analysis and scenario reduction techniques	1, 2, 3
	Experience developing scripts, codes or automated workflows to support numerical modelling, data analysis or visualisation	1, 2, 3
	Experience using GIS tools for the analysis, visualisation and management of geospatial and infrastructure asset data	1, 3
	Practical experience (e.g. ground investigation, monitoring or laboratory testing) and/or experience of infrastructure design, construction, operation, maintenance, or collaboration with industry partners	1, 3
	Experience supporting the supervision of undergraduate, MSc and/or doctoral students	1, 3
	Experience securing, contributing to or supporting research funding applications	1, 3
Skills and abilities	Working knowledge of UK geotechnical infrastructure assets and asset management practices	1, 3
	Knowledge of strategies to account for variability and heterogeneity in material properties and ground conditions	1, 2, 3
	Understanding of probabilistic approaches for quantifying uncertainty, reliability and confidence	1, 2, 3
Other	Valid licence for driving in the UK	1
	Able and willing to spend occasional nights away from the University to attend meetings, workshops and conferences	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



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.