Applications are invited for a fully-funded three-year PhD to commence in October 2023.

The PhD will be based in the Faculty of Science and Health at University of Portsmouth, and will be supervised by Dr Arash Azizi, Dr Nick Koor and Dr Philip Benson. The project will be carried out in collaboration with University of Durham (Led by Prof. David Toll, up to 1 year placement) and Ramboll (up to 6 months placement).

Candidates applying for this project may be eligible to compete for one of a small number of bursaries available. Successful applicants will receive a bursary to cover tuition fees for three years and a stipend in line with the UKRI rate (£17,668 for 2022/23). Bursary recipients will also receive a contribution of £1500 per year towards consumables, conference, project or training costs.

The work on this project will involve:

- Training by experts in Geomechanics and Geotechnics including laboratory testing of geomaterials and constitutive modelling of their behaviour with the application for design and provision of geo-infrastructure

- Experimental work at Soil Mechanics laboratories of University of Portsmouth and University of Durham using advanced cyclic and dynamic apparatus

- Close collaboration with industry, particularly through an industrial placement opportunity provided by Ramboll (up to 6 month)

Project description

Climate change is responsible for the increase in more intense precipitation events and greater amplitude of warm temperatures. This leads to extreme wetting and drying (environmental loading) that can affect the performance of civil infrastructure including road and railway substructures, foundations of buildings and onshore wind turbines, embankments and earth dams where together with cyclic loads induced by traffic, train, earthquake and wind can lead to premature structural failure and loss of serviceability.

The soils interacting or forming the foundation geo-infrastructure are often unsaturated and frequently undergo moisture variations due to environmental loading. A new understanding of these key interactions may be derived through Unsaturated Soil Mechanics, an aspect that has frequently been neglected in design protocols to date mainly due to the lack of appropriate experimental data and poor understanding of the response of unsaturated soils to complex loading.

The aim of the proposed research is to develop a new theoretical and practical framework that considers the combined effects of environmental and cyclic loads on the long-term performance of unsaturated soils, aimed at mitigating climate risks and providing resilient and sustainable geo-infrastructure.

This will be achieved by assessment of the response of unsaturated soils to combined environmental and cyclic loading paths at small and large strain ranges by means of cyclic triaxial and resonant column testing;
developing constitutive models to predict the cyclic behaviour of the tested soils accounting for the effects of unsaturated conditions and environmental loading.
This project will provide exceptional experimental data and contribute to a more advanced dataset that will feed into models to predict the performance of geo-infrastructure under future climate scenarios. You will establish collaborations with experts in the fields of Geomechanics and Geotechnical Engineering, and you will be able to present your exciting findings at national and international conferences.

General admissions criteria
You'll need a good first degree from an internationally recognised university (minimum upper second class or equivalent, depending on your chosen course) or a Master's degree in an appropriate subject. In exceptional cases, we may consider equivalent professional experience and/or qualifications. English language proficiency at a minimum of IELTS band 6.5 with no component score below 6.0.

Specific candidate requirements
You will need a degree in Engineering Geology, Civil Engineering, Geotechnical Engineering, Geomechanics or Geoscience related subjects. A working background in soil mechanics laboratory testing or/and constitutive modelling is beneficial but not strictly required as training will be provided. Since the project includes laboratory work in University of Durham, you should be happy with locating in Durham (up to 12 months) and working in University of Durham's laboratory environment.

How to Apply
We'd encourage you to contact Dr Arash Azizi (arash.azizi@port.ac.uk) to discuss your interest before you apply, quoting the project code.

When you are ready to apply, you can use our online application form. Make sure you submit a personal statement, proof of your degrees and grades, details of two referees, proof of your English language proficiency and an up-to-date CV. Our 'How to Apply' page offers further guidance on the PhD application process.

If you want to be considered for this funded PhD opportunity you must quote project code SEGG7850423 when applying.

Funding Notes
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