Newcastle University PhD Studentship award

Title
Application of unsaturated soil mechanics and geomatics in slope stability

Value of award
100% of International tuition fees paid

Number of awards
1

Start date and duration
September 2019 for 3 years

Application closing date
8th February 2019

Overview
Slope stability refers to the capacity of a slope resisting to sliding movement due to both self-weight and external loading change. Slope instability in some scenarios can be catastrophic. Although the topic has been studied for decades, there are still new challenges coming up for us to face: 1) climate change induced extreme weather can deteriorate the functionality of a slope; 2) saturated soil mechanics-based slope design and calculation lead to enormously higher construction cost; 3) elasticity-based slope stability check will lead to over-optimistic result.

In urban and suburb of many cities with densified population, naturally and artificially formed slopes are not seldom. Slopes can be formed by residential development, transportation infrastructure building (e.g. highway, railway) (Fig.1), and hydrology-related embankment and dam, to name a few. With the progress of urbanisation in many areas, more and more regional areas become residential zones. In addition, population booming induced environmental problems, for example climate change, have undoubtedly imposed much more threats to those slopes, thereby threatening the safety of both people and properties. This has been widely accepted [1]. More frequent draught and over-wetting cycles has indeed created problems in some slopes already. For example, the extremely wet winter conditions of 2000 – 2001 and 2004 caused widespread slope failures in both natural and constructed slopes in SE England, Wales and Scotland as reported in [2-4]. Drought induced shrinkage cracks will also decrease the shear strength and integrity of earthen slopes. Moreover, these cracks will become the aqueduct and increase the erosion potential and rainfall infiltration during the wet seasons. These will significantly decrease the factor of safety of the slope.

Conventionally, to assess the stability of a slope, the calculation is primarily based on saturated condition. Therefore, higher cost will have to be spent to ensure the safety of a slope. However, in most scenario, the slope is unsaturated. If the design is based on unsaturated soil mechanics, the construction cost can be much lower and meantime can help taking better measurements for slope stabilisation.
The aim of the project is to develop a robust framework to predict the slope stability under various wetting conditions through modelling, laboratory testing, and in-situ monitoring.

**Sponsor**
*Faculty of Science Agriculture and Engineering* and *Chinese Scholarship Council (CSC)*

**Name of supervisor(s)**
Dr Yilin Gui, Dr Wen Xiao, Professor Stefano Utili, School of Engineering.

**Eligibility Criteria**
You must be a citizen and permanent resident of the People’s Republic of China at the time of application.

You should be a master graduate or nearly granted a master degree. However, very talented BEng, BSc graduate in relevant areas will also be considered.

English language skills (if English is not your native language): an overall score of IELTS 6.5 or equivalent, with individual scores of 6.0 in each of the four sub-skills: writing, reading, speaking and listening.

**How to apply**
You must apply through the University’s online postgraduate application system. [Apply here.](#) To do this please ‘Create a new account’. All relevant fields marked with a red asterisk must to be completed.

The following information will help us to process your application. You will need to:
- Insert the programme code 8040F in the programme of study section
- Select *PhD Civil Engineering (full time) - Civil Engineering (Geotechnical)* as the programme of study
- Insert the studentship code CSC1808 in the studentship/partnership reference field
- Attach a covering letter and CV. The covering letter must state the title of the studentship, quote reference code CSC1808 and state how your interests and experience relate to the project.
- Attach degree transcripts and certificates, if English is not your first language, a copy of your English language qualifications

**Contact**
For further detail, please contact Dr Yilin Gui (yilin.gui@ncl.ac.uk)