

Four post-doctoral positions at Hong Kong University of Science and Technology (HKUST) for studying wind-tree interaction

Project background

Urban greening has been advocated in metropolitan cities worldwide, with the aim to restore ecosystems and 'reclaim the natural environment' within the built environment. Governments have invested billions of dollars in planting trees and building urban forests. However, the increasing intensity of cyclones and hurricanes caused by recent environmental change has led to increasing numbers of tree failures. Existing methods of assessing urban tree risk are qualitative and empirical, relying on tree professionals' experiences to evaluate tree health.

Assessing tree stability under wind is complex and requires cross-disciplinary knowledge of the wind-tree-soil interaction. Funded by the Hong Kong Research Grant Councils (RGC), a cross-disciplinary and cross-institutional team with diverse backgrounds of tree ecology, soil science, wind/structural engineering and geotechnical engineering will combine their expertise to study tree stability problems. **Trees will be viewed as nonlinear, flexible structures subject to dynamic loading, a system that can be analysed quantitatively via engineering principles.** This project will adopt an all-round complementary research methodology, including field testing, physical modelling, numerical modelling and reliability analysis. **We are recruiting four post-doctoral research associates of different expertise/background to join the project:**

Job description:

Post-doctoral post 1 Physical modelling of wind-tree interaction

Candidate of this post is expected to assist in the design and manufacturing of a new wind tunnel system that is tailor-made for studying wind-tree mechanical interaction. He/she is also expected to design and conduct instrumented wind tunnel tests to study aerodynamics of trees of different canopy architecture and how tree deformation affects drag force (aka reconfiguration).

Post-doctoral post 2: Numerical modelling of wind-tree interaction and tree aerodynamics

Candidate of this post is expected to perform numerical simulations to capture the wind-tree mechanical interaction and tree aerodynamic behaviour. He/she is also expected to validate the numerical models, which will then be used to reveal the underlying mechanisms of tree failure modes through extensive parametric studies.

Post-doctoral post 3: Field and laboratory testing of tree biomechanics and root anchorage

Candidate of this post is expected to conduct *in-situ* tree pull-push over tests to measure root anchorage resistance. He/she is also expected to conduct laboratory testing of biomechanical properties of tree branches, stems and roots using a bespoke testing machine at the HKUST.

Post-doctoral post 4: Physical modelling of soil-root interaction

Candidate of this post is expected to design and conduct geotechnical centrifuge modelling to investigate soil-root mechanical interaction using the 400g-ton beam centrifuge at the HKUST. He/she is also expected to develop bespoke loading systems so tree pulling tests can be simulated in the centrifuge for evaluating root anchorage behaviour.

Job requirements:*Common requirements:*

(1) A PhD degree; (2) track records to publish articles in top-tier international journals; (3) interest in **collaborative multi-disciplinary research**; (4) able to conduct research work independently yet collaboratively; (5) abilities to communicate verbally and in written form in English

Specific requirements:

| Post | 1 | 2 | 3 | 4 |
|--------------------|-----------------------|--------------------------|--|----------------------|
| Background | Wind Engrg. | Wind Engrg./Mech. Engrg. | Ecology / Biology / Forestry / Civil Engrg. | Geotech. Engrg. |
| Experiences | Wind tunnel modelling | Numerical modelling | Field tree pulling / root biomechanical test | Centrifuge modelling |

Main Duties (apply to all posts):

- Design and implementation of research tasks assigned independently
- Synthesis of research findings in forms of journal article (primary) and conf. proceedings
- Provision of the support of project administration

Conditions of employment:

Salary is competitive and will be commensurate with qualifications and experience. Fringe benefits including medical & dental benefits and annual leave will be provided where applicable. Initially appointment will normally be made on a 1-year contract, renewable for a maximum of 3 years subject to performance and research output.

Application:

Interested candidates are invited to send (i) a motivation letter (< 2 pages); (ii) a CV including a full list of publication (both under review and in press/accepted); (iii) names of 2 references; and (iv) abstract of PhD thesis and copies of master or/and doctoral degrees and transcripts to, Prof Tim K.T. Tse (timkttse@ust.hk).

Shortlisted applicants are expected to give a short presentation of their PhD work (remotely) and be interviewed by project members. Review of applications will begin immediately and continue until the positions are filled. Starting date is as soon as possible.

About *Department of Civil and Environmental Engineering at the HKUST* (www.ce.ust.hk)

The Department has 30 faculty members, teaching about 480 undergraduate students and 200 postgraduate research students. Offering academic degrees in BEng, MSc, MPhil and PhD, we conduct comprehensive teaching and research programs in basic and applied aspects of civil engineering. The Department is equipped with state-of-the-art research facilities and is ranked consistently among the **top 20** in the world according to the **QS World University Rankings**.