Engineering PhD Scholarship

Frequency dependent dielectric properties and their relation to mechanical, rheological, and mineralogical properties of soft soils

A postgraduate research scholarship is available to undertake a Doctor of Philosophy program based at The University of Queensland (UQ) in the field of Geotechnical Engineering.

Research Topic

Despite being investigated over a century, soft soil keeps attracting great interest because it plays an essential role in many aspects of the sustainable development of human society (see figure). Among a great number of geophysical methods used for soil characterization, electromagnetic method occupies an important and unique place due to its intrinsic advantages including non(less)-invasion, promptness and convenience in measurement, and high sensitivity. So far, the application of this method in soils is mainly focused on the microwave frequency range, exemplified by its extensive application in the determination of soil moisture. While the dielectric property in the microwave frequency range primarily reveals the motion of water molecules, the dielectric property in the radio frequency range in principle mirrors the interaction between water and soil particles, which is therefore capable of providing elaborate information on many soil characteristics such as structure, density, and porosity.

The objective of this project is to make significant advances in the understanding of the dielectric behaviour of soft soil in the radio frequency range and to establish a relationship between its dielectric property and some mechanical, rheological, and mineralogical properties. To achieve this goal, radio frequency dielectric measurement will be conducted on representative soft soils with well-characterized mechanical, geotechnical, and mineralogical properties. The experimental parameters will be further analysed, phenomenologically and numerically, to set up a fundamental relationship between them. Numerical analysis will be focused on identifying, at the pore scale, the individual contribution from the different phases to the net macroscopic response quantified as the portion of the electromagnetic energy reflected or refracted through the different interfaces. The research team based at UQ involves leading experts in soil mechanics, geotechnical engineering and scientific computing.
Eligibility Criteria
The successful candidate should:
- have a strong background in Mineralogy, Physics or Geophysics. Qualified graduates e.g. from Civil Engineering with a strong interest in electromagnetic measurement methods and Soil Mechanics are also encouraged to apply.
- be highly motivated;
- have excellent verbal and written communication skills in English;
- hold an Honours I or high Honours IIA degree.

Value
Successful candidate will receive a stipend of $25,849 per annum which will be indexed for the duration of the award. This scholarship will be for three years with a possible extension of up to six months.

How to apply
Interested individuals should submit an expression of interest including the following in a single pdf to Dr Alexander Scheuermann (a.scheuermann@uq.edu.au):
- curriculum vitae (including lists of publications and 3 referees with contact details);
- brief statement about research interests and experience (1-2 pages);
- academic transcripts (undergraduate/postgraduate, with English translations if required);
- evidence of English proficiency;


APPROVAL AND ENROLMENT
The successful applicant will be formally invited to apply for a PhD, and will then need to submit the following documentation:
- Hardcopy of completed certified academic transcripts and official certification of degrees and diplomas awarded including certified English translations where required (unless qualifications are from the University of Queensland)
- Evidence of English proficiency, if required; the minimum scores for IELTS, TOEFL and Pearson Test are: IELTS Academic TOEFL – Paper based TOEFL – Internet Based (iBT) Pearson Test

<table>
<thead>
<tr>
<th>IELTS Academic</th>
<th>TOEFL – Paper based</th>
<th>TOEFL – Internet Based (iBT)</th>
<th>Pearson Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Score</td>
<td>All other sub-bands</td>
<td>Total Score</td>
<td>TWE (Test of written English)</td>
</tr>
<tr>
<td>6.5</td>
<td>6</td>
<td>570</td>
<td>5</td>
</tr>
</tbody>
</table>

Tests expire after two years and must be valid at the time of your commencement of candidature.
- Certified documentary evidence of the duration and attendance status of any previous research higher degree enrolment. If the previous research higher degree enrolment was undertaken in Australia, students must also provide evidence of consumed research higher degree student load, measured in Equivalent Full-time Student Load (EFTSL).

The scholarships for the PhD degree are subject to academic approval, and the candidates will be enrolled in Research Higher Degree (RHD) programs at UQ - See more at: http://www.uq.edu.au/grad-school/our-research-degrees.