

Modelling cyclic loading using hyperplasticity

by Guy T. Houlsby

Wednesday 10 July, 14.30-16.00, Room 2.62, Faculty CEG

Abstract:

Hyperplasticity is an approach to constitutive modelling in which the entire response of a material is specified through the knowledge of just two scalar functions. It has the advantages that (a) the mathematical structure is simple and (b) the materials defined are guaranteed to obey the laws of thermodynamics. In geotechnical engineering much of the focus of recent efforts in constitutive modelling has been the realistic modelling of problems involving many millions of cycles. The talk will address some of the challenges of these problems, and will focus on the development of the HARM (Hyperplastic Accelerated Ratcheting Model) approach to modelling cyclic loading.

Bio:

Guy Houlsby has been Professor of Civil Engineering at Oxford University since 1991, and was Head of the Department of Engineering Science from 2009-2014, leading the Department's REF2014 submission which achieved the highest quality score of any engineering department in the UK.



He is an internationally recognised expert on geotechnical engineering, where his main interest is in offshore foundations. Applications include structures for the oil and gas industry, but more particularly in recent years for offshore wind turbines. He also works in theoretical soil mechanics and plasticity theory, developing a rigorous thermodynamically-based approach to constitutive modelling. His current work brings together these two threads of work, developing models for cyclic loading of foundations for offshore wind turbines.

His interests in renewable energy also include work on tidal power. Analytical and numerical methods are used to understand tidal resources at scales from a single device through to a tidal basin. The patented "Transverse Horizontal Axis Water Turbine" (THAWT) for extracting tidal stream energy is currently being developed; and he is a Director of Kepler Energy, the spin-out company from Oxford University promoting THAWT.

His research is supported by government funding and co-operation with industry, especially in the offshore sector. He regularly lectures in the UK and abroad, and in 2014 gave the prestigious Rankine Lecture on "Interactions in Offshore Foundation Design", invited by the British Geotechnical Association. He acts as a consultant in civil, geotechnical and offshore engineering, including legal and arbitration cases.

His first degree and PhD are from Cambridge University. In 2003 he was awarded a DSc degree by Oxford University. He is a Fellow of the Institution of Civil Engineers and of the Royal Academy of Engineering.