

Master in Offshore Engineering - June 7th Seminar

Computational Modeling and Experimental Testing of Offshore Structures for the Wind Industry:
Overview of Ongoing Research at Aarhus University

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A comparison of reduced-order foundation models for the integrated modeling of monopiles and wind turbines by Dr. Andrea Franza, Assistant Professor in Geotechnical Engineering (anfr@cae.au.dk). Computationally efficient models are needed for the design of offshore wind turbines considering load variability. The presentations will discuss the implication of monopile foundation models on their design. In particular, two recently proposed reduced-order foundation models (the PISA approach and the REDWIN macro-element, calibrated on refined three-dimensional simulations) are compared with linear elastic lumped and API p – y springs in the context of varying limit state assessments.

Optimal design of hybrid testing campaigns for floating structures by Dr. Giuseppe Abbiati, Assistant Professor in Structural Mechanics (abbiati@cae.au.dk). Testing floating structures at a large scale, considering both hydrodynamic and aerodynamic loading, is often impossible. First, aerodynamic and hydrodynamic physics do not scale with the same similitude law leading to an inconsistent representation of the prototype system. Second, few experimental facilities can combine aerodynamic and hydrodynamic testing in a single setup. Hybrid testing emerged as a key-enabling solution to enable testing of these structures considering both loadings. Most of the research in this area has been dedicated to coupling simulation models with either hydrodynamic or aerodynamic experiments. This presentation instead presents a framework for quantifying the utility of an experimental campaign prior to its execution so that the budget allocated for testing can be optimized.



Andrea Franza holds a Ph.D. in Civil Engineering from the University of Nottingham (UK), where he studied the effect of tunneling on piled structures. As a Postdoc, he joined the University of Cambridge (UK) and the Universidad Politécnica de Madrid (Spain). Currently, he is Assistant Professor in Geotechnical Engineering at Aarhus University. His research activity focuses on underground construction and the mechanics of deep foundations. For this, he made use of reduced-scale physical testing, numerical modeling, and field monitoring.



Giuseppe Abbiati graduated in Civil Engineering from the Polytechnic of Turin, Italy, in 2009. He developed his doctoral thesis on seismic hybrid testing at the University of Trento, Italy (2010-2014). After awarding a Swiss Government Excellence Scholarship, he joined the Chair of Structural Dynamics and Earthquake Engineering of ETH Zurich, Switzerland (2014-2018). There, he started working on hybrid fire testing. In 2019, he joined Aarhus University, Denmark, where he is currently employed as an Assistant Professor in Structural Mechanics at the Department of Civil and Architectural Engineering. Here, he started developing new hybrid testing concepts for the wind industry.