YEAR: 2013-2016

PhD proposal

Scientific direction (DS)
Office of the no permanent scientific employments
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Technical unit: GERS
Thesis adviser at the IFSTTAR: Sandra Escoffier ☎:+33 (0) 2 40 84 58 21
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PhD supervisor: Panagiotis Kotronis ☎:+33 (0) 2 40 37 68 93
E-mail : Panagiotis.Kotronis@ec-nantes.fr
Doctoral school: SPIGA
Higher education institution registration: Ecole Centrale de Nantes

Topic: Behavior of offshore wind turbines under seismic loadings

Detailed description of the subject:

The study of wind turbines is one of the privileged research themes of the renewable energetic resources strategy of the French national agency ADEME (AMI large wind turbine project). The development of offshore wind turbines is considered as a main scientific and industrial goal for the forthcoming years.

The design of the foundations of such structures requires the study of their complex behaviour and interactions with the upper structure and this particular for seismic loadings. Considering the soil-foundation-structure interactions is one of the key points to perform an optimum design. In order to study these phenomena, dynamic centrifuge tests on reduce scale models are necessary as they provide valuable experimental data. The same data can be used to calibrate and validate numerical modelling strategies integrating the different existing nonlinearities between the soil, the foundation and the upper structure system.

The proposed PhD subject includes both an **experimental** and a **numerical** part:

A first series of centrifuge tests will be performed to analyze the dynamic properties of the soil foundation system using accelerometer measurements. This preliminary step will also deal with the design of the offshore wind turbine structural system (foundation upper structure), the instrumentation and the definition of the experimental procedure (set up and loading history). Reproducibility tests are needed to validate the procedure. Eventually, tests on a reduce scale model will be performed based on numerical computations in order to adapt the specimen dimensions to the IFSTTAR centrifuge and shaker systems. A second series of tests will be devoted to parametrical studies in order to evaluate the effect of the input frequencies and amplitudes and to provide recommendations for an optimized design.

The numerical work will be done on two steps: A 3D finite element model able to reproduce the behavior of the shaker and the soil foundation system and the development of an adequate macro element in order to perform fast and robust scientific calculations.

This PhD will be conducted under the direction of Sandra Escoffier (Research Fellow at Institut Français des Sciences et Technologies des Transports de l'Aménagement et des Réseaux, Nantes) and Panagiotis Kotronis (Professor at Ecole Centrale de Nantes). More specifically, the experimental part will be performed at IFSTTAR Nantes center and the modeling part at Ecole Centrale de Nantes.

The candidate should have a taste for experimental, modeling and teamwork.

The amount of the allocated grant is approximately 1764 € gross per month during the first two years and 2058 € gross per month during the third year.

Before the 15th of April : the candidate must provide a CV, a motivation letter and a transcript of his master degree grades to:

Sandra Escoffier: sandra.escoffier@ifsttar.fr
tel: 33 (0) 2 40 84 58 21

Panagiotis Kotronis: Panagiotis.Kotronis@ec-nantes.fr
tel: 33 (0) 2 40 37 68 93

Before the 29th of April : the candidate, in accordance with the supervisor, should fill an application on the website : http://www.ifsttar.fr/publication/theses/candidats/index.php

Beginning of the PhD: September or October 2013