VRIJE UNIVERSITEIT BRUSSEL

The faculty of Engineering of the Vrije Universiteit Brussel invites you to attend the public defense leading to the degree of

DOCTOR OF ENGINEERING SCIENCES

of **Negin Sadeghi**

The public defense will take place on **Thursday 12th December 2024 at 3pm** in room **D.2.01** (Building D, VUB Main Campus)

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# LONG-TERM DATA-BASED FATIGUE ASSESSMENT OF STEEL STRUCTURES WITH FOCUS ON OFFSHORE WIND TURBINES

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## Abstract of the PhD research

My PhD research's focus is on the fatigue characteristics of structures, with an emphasis on the support structures for offshore wind turbines (OWTs). The oldest offshore wind farms (in Belgium) are currently approaching their design lifetime, which is typically 20 to 30 years, and their operators want to decide on whether to extend that period, or decommission the farm, or even how to optimize the farm control to increase the average life of a farm. Today, fatigue is a major factor in the design of foundations for OWTs, particularly monopiles. As a result, improving our understanding of fatigue and refining our methodologies may enable us to optimize future OWT designs and extend the lifetime of the present structures. Re-evaluating design lifetime estimates can be done by using structural health monitoring (SHM) systems, such as strain gauge sensors. It is possible to monitor, collect, and measure the stresses experienced by the support structure using arrays of strain gauges set at specific locations on the OWT. To evaluate the long-term fatigue measures, this thesis focuses on developing new procedures or improving existing ones. Consequently, the lifetime extension or optimization of these structures can be studied by having more accurate techniques of calculating the fatigue indicators.