

## Assignment Name

<b>Client</b>	Tarucca in cooperation with Hanze Wind Energy
<b>Related project</b>	PUMSWindT2, development of Small Wind Knowledge
<b>Start date</b>	February 2025
<b>Suitable for training course(s)</b>	Internship and Graduation project for Bachelor, EMRE Master, or other MSc program with affinity for mechanical engineering as well as electrotechnical engineering
<b>Learning Community</b>	Wind Energy

## Assignment description

Problems with wind turbine blades arise due to manufacturing defects, environmental degradation (such as degradation caused by rain), environmental events (such as lightning damage), aerodynamic imbalances (such as pitch misalignment) and mass imbalances (such as infiltrated liquid). These problems not only negatively impact the turbines energy output through reduced aerodynamic efficiency, but also decrease the lifetime of components like the drivetrain due to unbalanced loading.



Figure 1: 5kW Braun Antaris Wind Turbine @ EnTranCe

Condition monitoring systems are therefore essential for the autonomous detection of damage in wind turbine blades, especially at remote locations that demand rare calm weather conditions to inspect them. For these systems a balance must be found between high sensitivity to damage and low amount of false alarm. While these systems are common in large-scale turbines, they are less developed for small-scale turbines due to cost and complexity. As these small-scale turbines become more common, there will be an expanding need for low-cost monitoring solutions.

Recent advancement in photonic monitoring equipment used for large-scale turbines proof to enable real-time predictions and a predictive maintenance strategy to be implement. As these solutions scale up and the price goes down, it's time to validate how such system would be beneficial for small-scale wind turbines.

The 5kW Braun Antaris Wind turbine at EnTranCe (see figure 1) is a small scale turbine, and it is intended to use this wind turbine for this project.

## Assignment

The professorship wind energy participates in the PUMSWindT2 consortium (Performance Upgrade of Medium and Small Wind Turbines). These projects amongst others focus on performance monitoring via sensor systems. With photonic sensor data and AI software it is expected that the energy loss of erosion/malfunction of the turbine can be balanced against the costs of repairs.

In previous graduation projects a plan has been developed for implementing photonic sensors on wind turbine blades to monitor structural integrity, predict maintenance, and optimize energy output. The research and design of such a system for sensor integration and predictive maintenance is now underway, and to be implemented on EnTranCe facilities. The measurement system is now in the phase of being built.

The new assignment focusses on detailing out a plan of action and further work on the results of the previous projects, to actually implement the sensors on blades of a running turbine, to be able to extract and interpret valuable data. Research possibly needs to be done to further improve the required measuring systems with an estimate of costs, and to define whether/how such tests can be done at the EnTranCe facilities and possibly the Energy Campus Leeuwarden. A design of the set up has already been made. Depending on the work of the student that is currently working on the project, the new student is invited to improve the proto set up, and start collecting and interpreting data. As this is expected to be a long term project, the student will also be asked to report recommendations that will enable successors to further work on the project.

The project is done in collaboration with photonic sensor specialist Tarucca and possibly with Wind turbine manufacturers.

The student is given a large degree of freedom to shape the project himself, whereby the associated responsibility and ownership is expected from her/him.

## General information

<b>Final Product</b>	To successfully complete the projects, the following possible steps can be considered, for example <ul style="list-style-type: none"> <li>•Literature and experimental research and interviews with experts/partners (important source reached is: “Long term research agenda of the European Academy of Wind Energy” and “Current status and grand challenges for small wind turbine technology”)</li> <li>•Research and advice report with measurement results</li> <li>•Basic design of the proposed and actual building of pilot</li> <li>•Actual measurement and testing</li> </ul>
<b>Location</b>	EnTranCe
<b>Parties involved</b>	WindMolens op Maat, professorship Wind Energy
<b>Contact person</b>	Arjen de Ruijter (professorship Wind Energy), Jesse van Kempen (Tarucca)
<b>Guidance</b>	Process guidance from the professorship Wind Energy, expertise guidance from company Tarucca
<b>Details</b>	

## Photo and/or video

For more info on Tarucca, please visit their website: <https://www.tarucca.com/>

## What are we and where can you find us?

EnTranCe is a learning knowledge community, in which students and teacher researchers from various programmes work together with researchers, companies, governments and civil society organisations to accelerate the energy transition.

EnTranCe is the place where, as a student, you work together with lecturers, researchers, businesses, governments and/or civil society organisations on complex issues. We do this at the following locations:

- Location Proeftuin, Zernikelaan 17
- Location Energy Academy Europe, Nijenborgh 6.

## What do we offer?

EnTranCe offers you a multidisciplinary, inspiring learning, working and research environment in which you can develop the competencies needed to shape and accelerate the energy transition. There is room for collaboration with professors, researchers, lecturers and the professional field. In addition, you will be supervised by professionals who are part of the EnTranCe Learning Communities (ELC).

## Contact us

Are you interested in the vacancy? Do you have questions or would you like to apply directly?

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