T-863-WIND **WIND POWER** **8 ECTS**

Year of study:	3rd year (final year BSc) /4th or 5th year (first or second year MSc).
Semester:	Spring.
Level of course:	4.-5. Second cycle, Introductory-Intermediate.
Type of course:	Elective. *Recommended elective for MSc Energy Engineering and MSc Mechanical Engineering.*
Prerequisites:	Introductory course in Fluid Mechanics (at the level of T-536-RENN).
Schedule:	Runs for 12 weeks – 6 teaching hours a week.
Supervisor:	Ármann Gylfason.
Lecturer:	Ármann Gylfason.

Learning outcome: At the end of the course, the students will have:

- Knowledge of the fundamentals of the atmospheric boundary layer which relate to wind power.
- Knowledge of the basics of horizontal axis wind turbines, efficiency, and energy extraction.
- Skills in analyzing the aerodynamic performance of a given wind turbine, applying Blade Element Theory.
- Skills to to design an experiment, applying appropriate engineering and measurment techniques to address the research goals.
- Competence in assessing the power generation of a given wind turbine configuration.
- Competence to analyze and present data or findings in reports and presentations, appropriate to describing the project for both scientific and general audience.

Content: This is a project-based course on wind power. Fundamentals of; the relevant boundary layer theory will be covered, fluid mechanics and aerodynamics of horizontal axis wind turbines, structural wind loadings of wind turbine blades. The student will design, implement and perform a wind tunnel experiment specifically designed to evaluate wake properties of a wind farm configuration; this includes developing and implementing a test facility, selecting and deploying appropriate sensors; in addition to analyze and processing data, and interpret results.

In this course we will cover relevant fluid dynamics and design concepts for horizontal axis wind turbines. We will study wind farm configurations and relevant topics of the atmospheric boundary layer, and discuss field measurements and classification of wind regions. A part of the course will be devoted to experiments in a wind tunnel facility, with emphasis of getting better understanding of fluid flow and gaining experience in writing scientific reports.

Reading material: The following texts are on reserve at the RU library: Manwell, McGowan, Rogers, *Wind Energy Explained*; Hansen, *Aerodynamics of Wind Turbines*; Wyngaard, *Turbulence and the Atmosphere*. Journal articles, manuals and catalogues will be posted online at the library reserve.
Teaching and learning activities: The class meets two times a week. Discussions, presentations, lab work.
Assessment methods: Final grade will be based on: Participation 10%; Homework and small projects 20%; Lab and design reports 30%; Final exam 40%.
Language of instruction: English.