Master study course Renewable Energy Systems (M. Eng.)

Module – No.		851		Mandatory module
Module name		**Wind Power Plants**		
Module coordinator		Prof. Dr.-Ing. Thomas Link		
Title		Wind Power Plants		
Title of examination		Wind Power Plants		
Semester		1		
Course type	Language	Lecture		English
SWS/ ECTS/ Workload		3 V / 1 P	5	150
Requirements for attendance		No		

1. Content and objectives

Content:

- Classification of Wind Turbines
- Aerodynamics of Wind Turbines
- Betz's Theory and Schmitz's Design rules
- Aerodynamic of the Darrieus Turbine
- Control of Wind Turbines
- Wind Turbine Design
- Wind Characteristics and Resources
- Hands-on-Training with an Aero-Elastic-Code

Learning goals:

The participants know the fundamental physical procedures that are vital for the usage of wind energy. They can use lift diagrams and calculate lift and resistance for given diagrams. The students are able to evaluate the optimal shapes for predefined profiles using Betz's law and determine efficiency and the power coefficient of wind turbines under idealized conditions. They are familiar with the different regulation concepts used in wind energy systems and are able to show the constructive peculiarities of the installations. The students know the advantages and disadvantages of applied construction variants of wind turbines. They are able to work with probability density functions and capable of calculating wind velocity for given roughness lengths to then estimate the power output of wind turbines using power curves.

Due to their internship, the participants are able to utilize the basic functions of the software Bladed. They can design a wind turbine with predefined features and select different design options using Bladed.

2. Method(s) of instruction

3 SWS Lecture and 1 SWS practical training.

3. Requirements for attendance

There are no formal requirements for participation. A successful degree in the module of fluid dynamics is recommended.

Literature:

[1] R. Gasch, J. Twele, Wind Power Plants, Springer, 2012

[2] J.-P. Molly, Windenergie: Theorie, Anwendung, Messung, Verlag C. F. Müller, 1990

[3] E. Hau, Wind Turbines, Springer, 2006

[4] J. F. Manwell, et. al., Wind Energy Explained: Theory, Design and Application, Wiley, 2009

4. Usability of this module

The module is offered as mandatory module in the master study course „Renewable Energy Systems“ (M.Eng.)

5. Requirements for assessment

Requirement for earning credit points is a test performance rated at least „sufficient“ in the module exam (written exam, 90 min) and a completed internship as a prerequisite.

6. ECTS credits

The grade corresponds to the grading of the exam. When completing the unit successfully, students are granted 5 credit points (ECTS).

7. Frequency of offer

The module is lectured in the spring semester

8. Work load

The workload consists of visiting lectures (33,75 h), participation in the presence internship (11,25 h), preparation and debriefing of the subject matters (45 h), processing of internship tasks (30 h) as well as preparation of the written exam (30 h). The total workload amounts to 150 h which corresponds to 5 ECTS.
9. Duration of module
The module is lectured in one semester