Examination Regulations for the Online Wind Energy Systems Master's Program of the Faculty of Civil and Environmental Engineering at the University of Kassel from November 27, 2018

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§ 1 Applicability

The examination regulations for the postgraduate Wind Energy Systems program of the Faculty of Civil and Environmental Engineering supplements the general provisions for examination regulations of the bachelor's and master's degrees at the University of Kassel in their respectively valid version.

§ 2 Academic Degrees, Profile

(1) The aim of the Wind Energy Systems master's program is to impart comprehensive knowledge in the field of wind energy. The purpose of this study program is to provide specialist knowledge and skills in the technical and non-technical aspects of the generation and use of wind energy. This study program qualifies students to analyze, design, develop and operate wind energy systems. In terms of content, there are two fields of specialization: "Simulation and Structure Technology" and "Energy System Technology".

(2) Students who have passed the master's examination will be awarded the academic degree of "Master of Science" (M.Sc.) by the Faculty of Civil and Environmental Engineering

(3) The Wind Energy Systems master's program is designed to be predominantly research-oriented

(4) This program can be completed on a part-time extra-occupational basis. It is designed as a distance learning course and uses various information and communication technologies for multimedia learning.

§ 3 Standard Duration and Scope of Studies

(1) The standard duration of a master's study program, including the master's thesis and the colloquium, is seven semesters.

(2) A total of 120 credits will be awarded to students who successfully complete the master's program, 30 of which will be allocated to the final master's module.

(3) The study program, including the examinations, is held in English.

§ 4 Start of the Study Program, Fees

(1) The master's program can only be commenced in the winter semester.

(2) Fees for the course shall be charged on a semester basis, the amount of which shall be determined by the Executive Board.

§ 5 Examination Board

(1) Decisions on examination matters within the Wind Energy Systems master's program are made by the Examination Board.
(2) The Examination Board is composed of representatives from the faculties of Civil and Environmental Engineering, Mechanical Engineering, Electrical Engineering / Computer Science, Mathematics and the Fraunhofer Institute for Energy Economics and Energy System Technology (IEE).

The Examination Board shall be composed of:

- one professor from the Faculty of Civil and Environmental Engineering,

- one professor from the Fraunhofer IEE,
- one professor from the Faculty of Mechanical Engineering or Electrical Engineering / Computer Science or the Institute of Mathematics,
- one research associate from the University faculties or from the Fraunhofer IEE departments participating in the master's program,
- one student who attends the Wind Energy Systems master's program.

(3) Professors are elected by the councils of the respective faculties whereas the research associate and the student member are selected by the council of the Faculty of Civil and Environmental Engineering in coordination with Fraunhofer IEE.

(4) In accordance with § 6, Para. 3, the Examination Board may delegate compulsory academic counseling to the university lecturers in charge and, in exceptional cases, to other duly qualified persons.

§ 6 Admission Requirements

(1) Eligible for admission to the master's program is whoever:

1a. holds a bachelor's degree, diploma or an equivalent degree comprising at least 180 credits either obtained at a university located in the Federal Republic of Germany or at a equivalent institution abroad in a technical or natural science course in the fields of civil and environmental engineering, mechanical engineering, electrical engineering, physics, or in a comparable technical study program

or

1b. holds a bachelor's degree, diploma or an equivalent degree of at least 180 credits in another study program, either obtained at a university located in the Federal Republic of Germany or at an equivalent institution located abroad and has thereby acquired at least 60 credits in basic subjects from the fields of mathematics as well as in natural and engineering sciences, including at least 18 credits in mathematics (analysis, algebra).

and

2. has acquired the following qualifications during his or her previous studies
- "good" knowledge of mathematics
- "good" knowledge of technological sciences
- "good" basic knowledge of natural sciences,

and

3. can convincingly outline his or her personal motivation in a letter of motivation (max. two pages) to be submitted alongside his or her application as well as demonstrate his or her suitability for pursuing this master's study program by providing evidence of previous academic achievements, internships and scientific work,

and

4. can provide evidence of professional experience of at least one year after obtaining his or her first university degree. If work experience was gained prior to the first university degree, the Examination Board will decide on equivalence on a case-by-case basis,

and

5. can provide evidence of B2 level language competence in English.

(2) If Paragraph 1b applies and the content requirements (60 credits from the fields of mathematics and natural sciences, of which at least 18 in mathematics (analysis, algebra) are not met, the

Examination Board may grant admission subject to the condition that the successful completion of additional achievements to the extent of up to 30 credits can be demonstrated by the time the master's thesis is completed.

(3) The fulfilment of the prerequisites defined in paragraph 1 is determined on the basis of a written application.

(4) Additional qualifying module examinations can be indicated in the diploma supplement.

§ 7 Credits, Module Examinations, Repeat Exams

(1) Module examinations must be completed within the temporal and factual scope of a module.

(2) The following examinations may be taken:

- Written examination (approx. 15 minutes per credit)
- Online examination (with subsequent online discussion - optional) (approx. 15 minutes per credit)
- Oral exam or oral online exam via Adobe Connect or similar (about 5 minutes per credit)
- Reports/written assignments (with subsequent online discussion - optional) (approx. 3 pages per credit)

The type of exam to be taken in a module or sub-module is determined by the lecturer according to the specifications of the study and the examination plan at the beginning of the course to which the exam relates,

(3) Course-related module examinations can also consist of several part exams (part module exams).

(4) Module exams are deemed passed if the average grade obtained at part module exams is at least "sufficient" (4.0).

(5) Failed module exams can be repeated twice. A repetition of passed module examinations is not permitted.

(6) When registering for an exam, the assignment to a module must be specified or the examination may be considered as an additional achievement.

(7) Upon the examiner's consent, module exams may be conducted in another language.

(8) In order to plan the content of their master's program, students shall set their own study plans after consulting with the Examination Board at the beginning of the course. Study plans have to be approved by the Examination Board. In accordance with § 6, additional module exams have to be listed in the study plan. The study plan may be modified after consulting with the Examination Board.

§ 8 Exam Parts in a Master's Degree

(1) The master's examination consists of the following module examinations including the master's final module according to § 10 and the corresponding credits.

Module	Description	Credits
Basic Modules	Fundamentals of Mathematics and Engineering Applied to Wind Energy Systems 36 credits from a selection of modules, of which a minimum of 30 are compulsory	30
Mandatory Elective Module	Application of Software Tools	6
Mandatory Elective Module	Mathematics	6
Mandatory Elective Module	Solid Mechanics	6
Mandatory Elective Module	Fluid Mechanics	6
Mandatory Elective Module	Electrical Engineering	6
Mandatory Elective Module	Design of Mechanical and Electrical Components	6
Specialization Modules and Additional Key Competences	126 credits from a selection of modules, of which a minimum of 60 is compulsory; and where at least 30 of those 60 credits must be achieved in one of the two fields of specialization ”Simulation and Structural Technology“ and ”Energy System Technology“	60
Specialization Modules	Simulation and Structural Technology	
Mandatory Elective Module	Theoretical Fluid Mechanics	6
Mandatory Elective Module	Computational Fluid Dynamics	6
Mandatory Elective Module	Linear Computational Structural Mechanics	6
Mandatory Elective Module	Non-linear Computational Structural Mechanics	6
Mandatory Elective Module	Strength and Reliability	6
Mandatory Elective Module	Rotor Blades	6
Mandatory Elective Module	On- and Offshore Foundations	6
Mandatory Elective Module	Rotor Aerodynamics	6
Mandatory Elective Module	Project Phase A	6
Mandatory Elective Module	Project Phase B	12
Specialization Modules	Energy System Technology	
Mandatory Elective Module	Wind Energy Meteorology	6
Mandatory Elective Module	Energy Storage	6
Mandatory Elective Module	Control and Operational Management of Wind Turbines and Wind Farms	6
Mandatory Elective Module	Construction and Design of Nacelle Systems	6
Mandatory Elective Module	Technical and Economic Aspects of Grid Integration	6
Mandatory Elective Module	Reliability, Availability and Maintenance Strategies	6
Mandatory Elective Module	Project Phase A	6
Mandatory Elective Module	Project Phase B	12
Additional Key Competences	24 credits from a selection of modules, of which a minimum of 12 is compulsory	
Mandatory Elective Module	On and Offshore Occupational Safety	3
Mandatory Elective Module	Energy Law	3
Mandatory Elective Module	Project Management	3
Mandatory Elective Module	Planning and Construction of Wind Farms	3
Mandatory Elective Module	Business Administration and Management of Wind Turbines and Wind Farms	3
Mandatory Elective Module	Contract Law	3
Mandatory Elective Module	Study Trip Week	3
Master’s Modules		30
Compulsory module	Master’s Thesis	25
Compulsory module	Colloquium	5

(2) At least 30 credits must be successfully completed in one of the two areas of specialization i.e. ”Energy Systems Technology" and ”Simulation and Structural Technology of Wind Energy Systems“. If more than 30 credits are obtained in the basic modules, 6 credits can be added to the compulsory part of 60 credits from the specialization modules and the additional key competences.

(3) Crediting can only take place if the prerequisites set for university admission are met at the time of crediting.

§ 9 Additional Key Competences

(1) To obtain a master’s degree in Wind Energy Systems, a total of 12 credits must be obtained in the modules relating to additional key competences.

§ 10 Final Master’s Module

(1) The final master’s module consists of a master’s thesis and a master’s colloquium. 30 credits shall be awarded for completing the final master’s module, of which 25 will be allocated to the master’s thesis and 5 others to the master’s colloquium.

(2) Students who have successfully completed modules worth at least 78 credits qualify for a master’s thesis. The Examination Board shall issue the topics and appoints reviewers who are to supervise the thesis. Students are entitled to make suggestions.

(3) The time required to complete a master’s thesis is six months and begins on the day the topic is announced. The topic of the master’s thesis may only be refused once and only within a period of one month. It must be designed in such a way that it can be delivered within the specified period.

(4) If the first submission deadline cannot be met for reasons that lie beyond the candidate’s responsibility, the Examination Board shall extend the submission deadline by the time the candidate has not been able to deliver, but by no longer than three months.

(5) The master’s thesis must be written in English.

(6) The master’s thesis has to be submitted to the Examination Board electronically and in due time.

(7) The master’s thesis is to be presented during a master’s colloquium. In addition to the candidate, examiners shall also take part in the colloquium. Students of the Wind Energy Systems program are entitled to attend the colloquium as listeners. The master’s colloquium should take place no later than three months after submitting the master’s thesis. The duration of the entire colloquium is 60 minutes. The minimum grade required in a master’s thesis for joining the master’s colloquium is “sufficient” (4.0)

(8) The minimum grade required in a master’s thesis and a master’s colloquium to pass the final module is “sufficient” (4.0). The grade of the colloquium is included in the final module grade proportionally to the way credits are split between master’s colloquium and master’s thesis (5 to 25). A master’s colloquium that does not reach the minimum grade of “sufficient” (4.0) may be repeated once.

§ 11 Composition and Weighting of Grades

(1) A module is passed and can be assessed as being part of a master’s degree if it has obtained the minimum grade of “sufficient” (4.0).

(2) If a module grade consists of several part exams, it will be calculated from the results obtained at those part exams in equal parts if the module description does not provide for specific weighting.

(3) The overall grade of the master’s examination is derived from the arithmetic mean of the module grades weighted by its credits.

§ 12 Coming into force

These Examination Regulations shall enter into force on the day following their publication in the University of Kassel's official newsletter.

Kassel, January 22, 2019

The Dean of the Faculty of Civil and Environmental Engineering

Prof. Dr. Bernhard Middendorf

UNIKASSEL
VERSITÄT

Fachbereich 14 – Faculty of Civil and Environmental Engineering

Study and Examination Plan
For the Online Wind Energy Systems Degree Course (M.Sc.)

Table of Contents

Fundamentals of Mathematics and Engineering for Wind Energy Systems

Course Types

Module	Application of Software Tools
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	By the end of this module, students shall be able to develop and implement structured programs using an object-oriented concept and to know how to use various simulation programs. Students will also acquire the ability to apply various mathematical problems in MATLAB and to simulate fluid flows in technical equipment in the finite volume software OpenFoam. In addition, students will be able to simulate structural components of wind turbines using a semi-commercial finite element software and to convert this knowledge into commercial finite element software packages, e.g. Abaqus, ANSYS, and Nastran. In particular, they should be able to generate geometric models, to mesh them and interpret the results properly.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	180 hours (20 hours of online contact hours, 40 hours of self-study, 120 hours of term paper)
Study Achievements	Multiple Choice Test (30 minutes)
Prerequisites for Admission to the Examination	None
Exam Results & Performance	Multiple choice test (30 minutes) and written term paper (25 pages). 25% (multiple choice test) and 75% (term paper) will be included in the overall grade of the module.
Number of Credits Awarded for this Module	6 credits

Fundamentals of Mathematics and Engineering for Wind Energy Systems

Module	Mathematics
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	By the end of this course, students shall be able to… • demonstrate that they have acquired basic knowledge of how to solve ordinary differential equations, • solve ordinary differential equations analytically, • demonstrate knowledge of partial differential equations and their behavior in solutions to simple elliptic, parabolic and hyperbolic problems, • choose and apply adequate numerical methods from various sciences, • complete tasks like interpolation, numerical integration, linear and nonlinear systems of equations and systems of ordinary differential equations.
Course Types	BL and/or EL
Requirements for Participation in the module	Enrollment in the Wind Energy Systems study program
Student Workload	180 hours (30 hours of online contact hours, 60 hours of self-study, 90 hours of exercises)
Study Achievements	None
Prerequisites for Admission to the Examination	None
Exam Results & Performance	Online oral exam (20-30 minutes) or written examination (90-120 minutes)
Number of Credits Awarded for this Module	6 credits

Fundamentals of Mathematics and Engineering for Wind Energy Systems

Module	Fluid Mechanics
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	By the end of this course, students shall be able to model flows in wind energy systems and to apply basic calculation methods to determine pressure, speed, forces and momentums in technical systems as well as to carry out experimental flow analyzes using various methods and devices.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	180 hours (27 hours of online lectures, 14 hours of online contact hours, 85 hours of self-study, 54 hours of homework, exercises)
Study Achievements	None
Prerequisites for Admission to the Examination	None
Exam Results & Performance	Online oral exam (30 minutes) and multiple choice test or e-examination (120 minutes)
Number of Credits Awarded for this Module	6 credits

Fundamentals of Mathematics and Engineering for Wind Energy Systems

Module	Solid Mechanics
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	By the end of the course, students will know the basics of linear elasticity theory and continuum mechanics. Furthermore, they will know how to describe technical issues with basic equations and be able to calculate stresses, strains or deformations in wind turbines components under load.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	180 hours (20 hours of online lectures, 60 hours of self-study, 40 hours of homework, exercises)
Study Achievements	None
Prerequisites for Admission to the Examination	None
Exam Results & Performance	Written examination (90 minutes) and online oral exam (30 minutes). Exam results/performance will be weighed 1:1 in the overall grade of the module.
Number of Credits Awarded for this Module	6 credits

Fundamentals of Mathematics and Engineering for Wind Energy Systems

Module	Electrical Engineering
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	By the end of this module, students will have basic knowledge of electrical engineering applied to wind energy systems, with a special focus on energy technology systems, simulation, control and regulation. Students should understand the mode of operation and functions of electrical systems and machines and have an overview of control and regulation processes. The ability to analyze, model and simulate systems rounds off this module at system level.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	180 hours (30 hours of online contact hours, 150 hours of self-study)
Study Achievements	None
Prerequisites for Admission to the Examination	None
Exam Results & Performance	Written examination (120 minutes) or oral examination (30 minutes) or written term paper (25 pages) with subsequent discussion and presentation of the term paper (30 minutes). 75% (written term paper) and 25% (subsequent discussion and presentation) will be included in the overall grade of the module.
Number of Credits Awarded for this Module	6 credits

Fundamentals of Mathematics and Engineering for Wind Energy Systems

Module	Design of Mechanical and Electrical Components
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	By the end of this course, students shall be able to… - design individual wind turbines) components in principle, - determine the optimal aerodynamic rotor design in principle and the optimal blade angle for the design wind speed, - calculate thrust and power characteristics in wind turbines, - determine the basic geometry of wind turbines, - evaluate different design concepts of transmission systems, - evaluate different types of gears and mechanical drives in nacelles, - understand the function of safety and brake systems in nacelles, - design different tracking systems in principle, - determine various aerodynamic, structural and dynamic loads on rotor blades and tower, - estimate functional loads on wind turbine components, - differentiate between different rotor blade materials, - decide which rotor blade materials are to be used, - differentiate which tower and foundation types are suitable for the corresponding wind turbine, - describe the basic design of a tubular, concrete or lattice tower with suitable foundations, - know the different legal requirements and transport options that are necessary for the construction, installation and operation of wind turbines and wind farms, - plan a new wind farm in principle and develop a Gantt diagram containing the main planning sections for the design, construction, commissioning and operation of wind farms, - know and understand the safety requirements and maintenance measures that are necessary to operate wind turbines, - know the steps that are necessary for certifying wind farms. Students - have understood the functionality of different types of wind turbines, - are able to describe the various components of wind turbines, - can determine a performance curve from a blade layout and setting, - are able to choose a suitable generator concept for a given rotor, - are able to describe a suitable drivetrain for a specific wind turbine, - are able to describe and understand the various requirements for the integration of wind turbines into the grid, - know and understand the different types of networks, - know and understand different models of grid control, - are able to describe different control concepts for island networks, networks and their networks.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	180 hours (30 hours of online contact hours, 150 hours of self-study)
Study Achievements	None
Prerequisites for Admission to the Examination	None

Exam Results & Performance	Written examination (120 minutes) or oral examination (30 minutes) or written term paper (25 pages) with subsequent discussion and presentation of the term paper (30 minutes). 75% (written term paper) and 25% (subsequent discussion and presentation) will be included in the overall grade of the module.
Number of Credits Awarded for this Module	6 credits

Specialization 1: Simulation and Structural Technology of Wind Energy Systems

Module	Rotor Aerodynamics
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	After completing the course, students will be able to analyze and assess the flow field of wind turbines and to carry out basic rotor blades design. Knowledge: Basics of aerodynamic processes in wind turbines and their application to the design of rotor blades. Competences: Assessment of performance data and key figures in wind turbines, use of numerical methods for designing blades, analysis of flow fields and evaluation in terms of energy transfer.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	180 hours (42 hours of lectures, 42 hours of exercises, 21 hours of online meetings, 75 hours of exam preparations)
Study Achievements	None
Prerequisites for Admission to the Examination	Successful participation in the Fluid Mechanics module
Exam Results & Performance	Written examination (60 minutes) or oral examination (30 minutes)
Number of Credits Awarded for this Module	6 credits

Specialization 1: Simulation and Structural Technology of Wind Energy Systems

Module	Theoretical Fluid Mechanics
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	By the end of the course, students will know how to model complex and 3D fluid flows in wind energy systems and how to calculate them analytically.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	180 hours (30 hours of online lectures, 60 hours of exercises, 90 hours of self-study)
Study Achievements	None
Prerequisites for Admission to the Examination	Successful participation in the Fluid Mechanics module
Exam Results & Performance	Multiple choice test (30 minutes) and online oral examination (30 minutes) or e-examination (120 minutes). 25% (multiple choice test) and 75% (oral exam or e-exam) will be included in the overall grade of the module.
Number of Credits Awarded for this Module	6 credits

Specialization 1: Simulation and Structural Technology of Wind Energy Systems

Module	Strength and Reliability
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	By the end of the course, students will be familiar with different approaches to determining strength and reliability in structures. They will know how to apply these concepts to the design of wind turbines components and they will be able to carry out numerical fracture mechanical analyzes as well as standard strength calculations.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	180 hours (30 hours of online contact study, 150 hours of self-study)
Study Achievements	None
Prerequisites for Admission to the Examination	None
Exam Results & Performance	Written examination (90 minutes) or online oral examination (30 minutes). Exam results & performance will be weighed 1:1 in the overall grade of the module.
Number of Credits Awarded for this Module	6 credits

Specialization 1: Simulation and Structural Technology of Wind Energy Systems

Module	Computational Fluid Dynamics
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	By the end of the course, students shall be able to develop and apply different methods of numerical simulation in order to approximately calculate multi-dimensional flows in wind energy systems.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	180 hours (30 hours of online contact study, 60 hours of exercises, 90 hours of self-study)
Study Achievements	None
Prerequisites for Admission to the Examination	Successful participation in the Fluid Mechanics module
Exam Results & Performance	Multiple choice test (30 minutes) and online oral examination (30 minutes) or e-examination (120 minutes). 25% (multiple choice test) and 75% (oral exam or e-exam) will be included in the overall grade of the module.
Number of Credits Awarded for this Module	6 credits

Specialization 1: Simulation and Structural Technology of Wind Energy Systems

Module	Linear Computational Structural Mechanics
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	By the end of the course, students will… • know the basic theory of the finite element method including the initial boundary value problem, the weak formulation and the discretization in space and time, • be familiar with various of the finite element formulations, their advantages and disadvantages as well as their strengths and limitations, • understand the static solution method using the finite element method, • know the eigenvalue analysis and its application to wind turbines, • will be able to develop a basic finite element program in MATLAB, • will be familiar with the application of finite element programs for the statistical and dynamic analysis of wind turbine components.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	180 hours (30 hours of online contact study, 90 hours of self-study, 60 hours of term paper)
Study Achievements	Course-related tests
Prerequisites for Admission to the Examination	Successful participation in the Mathematics and Solid Mechanics module
Exam Results & Performance	Written term paper (25 pages) with subsequent discussion and presentation of the term paper (30 minutes). 75% (written term paper) and 25% (subsequent discussion and presentation) will be included in the overall grade of the module.
Number of Credits Awarded for this Module	6 credits

Specialization 1: Simulation and Structural Technology of Wind Energy Systems

Module	Nonlinear Computational Structural Mechanics
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	By the end of the course, students will… • know the basics of the geometrically nonlinear finite element method including the initial boundary value problem, the weak form and discretization in space and time, • be able to interpret the linear finite element method as a special case of the nonlinear FEM, • understand the reason for and the procedure of linearization on the continuum mechanical, element, structure and algorithmic level, • understand the static solution process by using a load-controlled or arc-length Newton-Raphson method. Students will also understand the iteration schemes of the corresponding parameters, • know different time integration methods and their characteristics with regard to nonlinear dynamics, • will be able to create a basic nonlinear finite element program in MATLAB, • will be familiar with the applications of nonlinear finite element programs used for analyzing wind turbines components statistically and dynamically.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program, successful participation in the Linear Computational Structural Mechanics module
Student Workload	180 hours (30 hours of online contact study, 90 hours of self-study, 60 hours of term paper)
Study Achievements	Course-related examinations
Prerequisites for Admission to the Examination	None
Exam Results & Performance	Written term paper (25 pages) with subsequent discussion and presentation of the term paper (30 minutes). 75% (written term paper) and 25% (subsequent discussion and presentation) will be included in the overall grade of the module.
Number of Credits Awarded for this Module	6 credits

Specialization 1: Simulation and Structural Technology of Wind Energy Systems

Module	Rotor Blades
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	By the end of the course, students will know the basics of polymer materials and plastic process technology. Students will become familiar with the design and structure of rotor blades customary in the market, with the production of top layer and core materials as well as with that of sandwich-structured elements. Furthermore, students will be able to understand the manufacturing process and gain comprehensive knowledge on how components are structured and characterized. By the end of the course, students will have become familiar with the following contents: • Properties of plastics - Structure, chemical composition (thermoplastics, thermosetting plastics, elastomer) - Fiber reinforcement, structure of fiber reinforced components - Mechanical properties (depending on temperature and time) • Processing technologies - Introduction to plastic processing - Injection molding process - Extrusion, foam extrusion - Transfer molding (Resin Transfer Molding) - Reaction Injection Molding (RIM) - Tape laying and prepreg processing - Hand lamination • Sandwich-structured components - Structure of rotor blades - Fiber composites and facing materials - Core materials - Process technologies (gluing, lamination) • Material characterization - Mechanical test - Quasi-static examination, notch impact strength, fatigue - Physical characterization • Structure analysis, density measurement, thermal analysis, fiber orientation
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	180 hours (10 hours of online contact study, 150 hours of self-study, 20 hours of exercises)
Study Achievements	None
Prerequisites for Admission to the Examination	None
Exam Results & Performance	Written examination (120 minutes)
Number of Credits Awarded for this Module	6 credits

Specialization 1: Simulation and Structural Technology of Wind Energy Systems

Module	On- and Offshore Foundations
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	The aim of the module is to create a basis for understanding the material behavior of soils and to become familiar with the ground situation and the foundation method for WES which matches local environmental conditions. Students will understand soils as multiphase media. They will be able to control and identify the material parameters that have an impact on the deformation and strength of soils, especially under cyclic loading, and estimate them for different soil types. Students will become familiar with the laboratory and field tests used for exploring the subsoil situation at the location of a WES. Students will be familiar with the foundation methods suitable for WES, namely shallow and pile foundations, and they will be able to assess the possibilities and limits of such foundation methods taking into account subsoil situation and load effects. They will be able to determine deformations and the load-bearing capacity of WES foundations on the basis of standard geotechnical calculation methods. Students will be familiar with the numerical calculation methods used for simulating the load-bearing behavior of WES foundations. Students will be able to select a suitable foundation method for WES, taking into account subsoil conditions, load effects and local environmental conditions.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	180 hours (20 hours of online contact study/online lectures, 80 hours of self-study, 80 hours of exercises, homework)
Study Achievements	None
Prerequisites for Admission to the Examination	Successful participation in the Solid Mechanics module
Exam Results & Performance	Written examination (120 minutes) or oral examination (30 minutes) or written term paper (25 pages) with subsequent discussion and presentation of the term paper (30 minutes). 75% (written term paper) and 25% (subsequent discussion and presentation) will be included in the overall grade of the module.
Number of Credits Awarded for this Module	6 credits

Specialization 1: Simulation and Structural Technology of Wind Energy Systems

Module	Project Phase A
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	By doing project work, students will be able to devise practical solutions to problems that have been theoretically experienced to date. To develop an analytical approach to practical engineering tasks under the actual conditions of each on-site measure requires and promotes a deeper understanding of the various fields of activity involved in wind energy system technology. Key competences: Communication skills (self-reflection, conflict-solving and critical skills, team spirit); Organizational skills (self, time, stress and project management as well as institutional, administrative and system knowledge); Methodological skills (text work, presentation techniques, research activities) Focusing on the respective practical requirements, this module also contains elements of interdisciplinary studies in addition to the above-mentioned key skills. Interdisciplinary and extra-disciplinary knowledge is of relevance and often reflected in individual career choices after completion of the practical studies.
Course Types	PS
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	180 hours (140 hours of practice on site, 40 hours of self-study for the project report and final presentation)
Study Achievements	None
Prerequisites for Admission to the Examination	Successful participation in basic modules; proof of 5-weeks' project activity and submission of project report
Exam Results & Performance	Project report (15 pages) with subsequent discussion and presentation of the report (30 minutes). 75% (project report) and 25% (subsequent discussion and presentation) will be included in the overall grade of the module.
Number of Credits Awarded for this Module	6 credits

Specialization 1: Simulation and Structural Technology of Wind Energy Systems

Module	Project Phase B
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	By doing project work, students will be able to devise practical solutions to problems that have been theoretically experienced to date. To develop an analytical approach to practical engineering tasks under the actual constraints and condition of each on-site measure requires and promotes a deeper understanding of the various fields of activity involved in wind energy system technology. Key competences: Communication skills (self-reflection, conflict-solving and critical skills, team spirit); Organizational skills (self, time, stress and project management as well as institutional, administrative and system knowledge); Methodological skills (text work, presentation techniques, research activities) Focusing on the respective practical requirements, this module also contains elements of interdisciplinary studies in addition to the above-mentioned key skills. Interdisciplinary and extra-disciplinary knowledge is of relevance and often reflected in individual career choices after completion of the practical studies.
Course Types	PS
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	360 hours (280 hours of practice on site, 80 hours of self-study for project report and final presentation)
Study Achievements	None
Prerequisites for Admission to the Examination	Successful participation in the basic modules; proof of 9-weeks project activity and submission of project report
Exam Results & Performance	Project report (30 pages) with subsequent discussion and presentation of the report (30 minutes). 75% (project report) and 25% (subsequent discussion and presentation) will be included in the overall grade of the module.
Number of Credits Awarded for this Module	12 credits

Specialization 2: Energy Systems Technology

Module	Construction and Design of Nacelle Systems
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	By the end of this module, students will know the basic structures and development methods applicable to nacelle systems in modern wind turbines with a horizontal axis. Students will understand the basic topology and functionality of the electrical subsystem of modern variable-speed wind turbines, e.g. main inverter, transformer, switchgear and be familiar with the most common variants of electrical nacelle systems. Students will be able to calculate and dimension key mechanical components within the nacelle according to the performance requirements set for turbines as well extreme loads and operating loads leading to component fatigue caused by the rotor. Students will be able to identify and present the main advantages and disadvantages of drive concepts in a professional manner. The most important learning outcome in this module will be: Students will be able to develop their own concepts, to design drivetrains or create detailed specifications for nacelle / wind turbine drive components.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	180 hours (20 hours of online lectures, 40 hours of self-study, 120 hours of exercises)
Study Achievements	4-6 additional course-related tests (written term papers given as exercises)
Prerequisites for Admission to the Examination	None
Exam Results & Performance	Oral examination (20 minutes) and presentation (15 minutes). The exam results & performance will be weighed 1:1 in the overall grade of the module.
Number of Credits Awarded for this Module	6 credits

Specialization 2: Energy Systems Technology

Module	Wind Energy Meteorology
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	By the end of this module, students will have the following skills: • They will be familiar with the different types of neural networks and their applications to technical issues. They will be able to estimate different types of neural networks to solve various forecasting issues for wind power forecasting. • They will be able to design, expand and analyze neural models for the weather conditions described in wind power forecasts within the framework of MATLAB and to integrate these into the application program. • They will know how to present new models to a non-expert audience, how to explain the advantages and disadvantages of new approaches and how to make reliable statements on system reliability. • They will have gained basic knowledge about wind in the atmosphere and the underlying physical, meteorological and micrometeorological theory. They will also understand, on the one hand, that wind is the energy source of wind turbines, but that it is, on the other hand, also responsible for wind turbine stress. They will be able to apply meteorological knowledge to incorporate wind energy into power grids. • They will acquire the ability to use, assess and analyze the potential of wind energy. They will also gain knowledge of what state-of-the-art means in terms of wind measurement, characterization and modeling. • They will understand to what extent the design of wind turbines depends on wind conditions. They will be familiar with the parameters that are necessary for designing wind turbines and be able to determine or assess them. • They will be familiar with the basic challenges of incorporating a weather-dependent energy source such as wind into the power grid. They will understand how wind energy predictions makes the use wind energy possible and they will become familiar with methods used to predict wind energy performance.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	180 hours (20 hours of contact hours, 40 hours of self-study, 120 hours of term paper)
Study Achievements	Course-related tests
Prerequisites for Admission to the Examination	Successful participation in the Application of Software Tools module
Exam Results & Performance	Written examination (120 minutes) or written term paper (25 pages) with subsequent discussion and presentation of the term paper (30 minutes). 75% (written term paper) and 25% (subsequent discussion and presentation) will be included in the overall grade of the module.
Number of Credits Awarded for this Module	6 credits

Specialization 2: Energy Systems Technology

Module	Control and Operational Management for Wind Turbines and Wind Farms
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	By the end of this module, students will have completed control engineering tasks related to wind turbines and wind farms. By the end of this module, students will have gained insight into the most important control issues in wind energy technology and they will know how and where to find the usual solutions to these. This includes the following areas: • Purposes of control systems and key interactions, e.g. system control - structural loads, park control - grid behavior, etc. • Systematic draft control • Insight into current research topics Furthermore, students will have become familiar with the modeling of wind turbines and wind parks for control engineering purposes, with the fundamentals of grid control and grid connection conditions and with the strategies needed for controlling wind turbines in the part and full load range and wind parks for active and reactive power control as well as the certification guidelines and most common simulation tools.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	180 hours (30 hours of online contact hours, 60 hours of term paper/lectures presentation, 90 hours of self-study)
Study Achievements	Lectures presentation, term paper (12-15 pages)
Prerequisites for Admission to the Examination	Having passed the study achievements required.
Exam Results & Performance	Multiple choice test (30 minutes) and oral examination (20 minutes), weighting of the overall grade 1:2
Number of Credits Awarded for this Module	6 credits

Specialization 2: Energy Systems Technology

Module	Technical and Economic Aspects of Grid Integration
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	By the end of this module, students will have … - in-depth knowledge of the structure and function of electricity distribution networks and transmission networks, - a basic understanding and knowledge of the cause and effect of network perturbations in generating plants, - know how to protect generating plants & network equipment, - a basic understanding of the role of computer science in future energy supply and have an overview of ICT requirements and potential, - an overview of general aspects in network integration. - knowledge of the structure and functioning of the energy and control reserve market, - They will be familiar with the functionality and the tasks involved in frequency control as well as with the role of balance energy, - an overview of existing and possible flexibility options for energy supply and of their future role and requirements, - knowledge of the role and functionality of virtual power plants, - knowledge of the marketing and portfolio management value of wind farms and other energy suppliers.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	180 hours (20 hours of online contact hours, 20 hours of online lectures, 80 hours of self-study, 60 hours of exercises/written term paper)
Study Achievements	None
Prerequisites for Admission to the Examination	Successful participation in the basic modules covering 30 credits
Exam Results & Performance	Written examination (90 minutes) or oral examination (45 minutes)
Number of Credits Awarded for this Module	6 credits

Specialization 2: Energy Systems Technology

Module	Energy Storage
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	• Students will be familiar with the requirements of energy storage in energy systems. • Students will be able to differentiate the requirements of energy storage in various energy systems. • Students will be familiar with the theories of energy storage technologies at different time levels and they will know how to integrate these technologies into the energy system at different levels. • Students will be able to compare energy storage solutions in terms of system requirements and cost-effectiveness.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	180 hours (30 hours of online contact hours, 60 hours of exercises, 90 hours of self-study)
Study Achievements	None
Prerequisites for Admission to the Examination	None
Exam Results & Performance	Written examination (90 minutes) or written term paper (25 pages)
Number of Credits Awarded for this Module	6 credits

Specialization 2: Energy Systems Technology

Module	Reliability, Availability, Maintenance Strategies
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	Students will become familiar with different approaches to the collection and analysis of reliability data used for maintenance optimization. They will gain insight into legal requirements, industrial standards and optimization strategies. They will be able to apply these strategies to the operation and maintenance of wind farms and they will use the information obtained from these and additional information obtained from various monitoring systems.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	180 hours (30 hours of online contact hours, 150 hours of self-study)
Study Achievements	None
Prerequisites for Admission to the Examination	None
Exam Results & Performance	Written examination (120 minutes) or oral examination (45 minutes)
Number of Credits Awarded for this Module	6 credits

Specialization 2: Energy Systems Technology

Module	Project Phase A
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	By doing project work, students will be able to devise practical solutions to problems that have been theoretically experienced to date. To develop an analytical approach to practical engineering tasks under the actual constraints and condition of each on-site measure requires and promotes a deeper understanding of the various fields of activity involved in wind energy system technology. Key competences: Communication skills (self-reflection, conflict-solving and critical skills, team spirit); Organizational skills (self, time, stress and project management as well as institutional, administrative and system knowledge); Methodological skills (text work, presentation techniques, research activities) Focusing on the respective practical requirements, this module also contains elements of interdisciplinary studies in addition to the above-mentioned key skills. Interdisciplinary and extra-disciplinary knowledge is of relevance and often reflected in individual career choices after completion of the practical studies.
Course Types	PS
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	180 hours (140 hours of practice on site, 40 hours of self-study for the project report and final presentation)
Study Achievements	None
Prerequisites for Admission to the Examination	Successful participation in the basic modules; producing evidence of five weeks' project activity and submission of a project report
Exam Results & Performance	Project report (15 pages) with subsequent discussion and presentation of the report (30 minutes). 75% (project report) and 25% (subsequent discussion and presentation) will be included in the overall grade of the module.
Number of Credits Awarded for this Module	6 credits

Specialization 2: Energy Systems Technology

Module	Project Phase B
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	By doing project work, students will be able to devise practical solutions to problems that have been theoretically experienced to date. To develop an analytical approach to practical engineering tasks under the actual conditions of each on-site measure requires and promotes a deeper understanding of the various fields of activity involved in wind energy system technology. Key competences: Communication skills (self-reflection, conflict-solving and critical skills, team spirit); Organizational skills (self, time, stress and project management as well as institutional, administrative and system knowledge); Methodological skills (text work, presentation techniques, research activities) Focusing on the respective practical requirements, this module also contains elements of interdisciplinary studies in addition to the above-mentioned key skills. Interdisciplinary and extra-disciplinary knowledge is of relevance and often reflected in individual career choices after completion of the practical studies.
Course Types	PS
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	360 hours (280 hours of practice on site, 80 hours of self-study for the project report and final presentation)
Study Achievements	None
Prerequisites for Admission to the Examination	Successful participation in the basic modules; producing evidence of five weeks' project activity and submission of a project report
Exam Results & Performance	Project report (30 pages) with subsequent discussion and presentation of the report (30 minutes). 75% (project report) and 25% (subsequent discussion and presentation) will be included in the overall grade of the module.
Number of Credits Awarded for this Module	12 credits

Additional Key Competences in Energy and Law

Module	Business Administration and Management of Wind Turbines and Wind Farms
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	Students will be familiar with various reporting requirements and obligations towards shareholders / owners and financiers as well as towards other information recipients such as electricity network operators, electricity traders and governmental agencies. They will be able to prepare their own reports for projects and adapt them to the needs of the recipients. Students will have knowledge of contract management and insight into the main and subsidiary contracts of wind power projects and they are aware of the main scope of supply and services in maintenance and operational management contracts as well as in land use rights. Students will be able to carry out a project assessment (due diligence) in which technical, legal and financial issues are examined and prepared in a way that facilitates investors' decisions. They will be able to create profitability calculations and financial models as well as liquidity plans and use these for plan and actual assessments. Students will be aware of differences in the remuneration models in Europe (feed-In remuneration, green certificates) and how these are integrated into financial planning models. Furthermore, they will be familiar with various government funding concepts towards the introduction of renewable energies into a given economy. They will know what the principles of completed project financing are with regard to the financing requirements of banks and mezzanine financing providers and they will be familiar with the specifics of special purpose companies. By the end of the course, students will be familiar with the following contents: – Reporting – Investor requirements for wind project performance reports – Differences between public companies and private investment firms – Structure of a report – Annual meeting of shareholders and annual reports – Creating a structure for self-reporting / criticism – Structure – Contract structure for wind projects – Organizational chart of wind projects – Responsibility of the managing directors/CEOs of wind project companies – Finance – Liquidity planning – Principles of financial modeling – Creation of a financial model for wind projects – Creation of a risk model – Changing input values to be able to estimate the impact on the result (scenario analysis) – Special aspects – Direct distribution of electricity – Duration of the high feed-in tariff scheme (Germany)

	– Dealing with accidents (crane) – Handling of special repair events – Funding systems for renewable energy – In-service inspections – Final work/closing operations after project transfer – Dismounting and repowering wind turbines
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	90 hours (5 hours of online contact study, 75 hours of self-study, 8 hours of written term paper, 2 hours of written examination)
Study Achievements	None
Prerequisites for Admission to the Examination	None
Exam Results & Performance	Written examination (60 minutes) or written term paper (15 pages) with subsequent discussion and presentation of the term paper (15 minutes). 75% (written term paper) and 25% (subsequent discussion and presentation) will be included in the overall grade of the module.
Number of Credits Awarded for this Module	3 credits

Additional Key Competences in Energy and Law

Module	Contract Law
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	The aim of this module is to provide students with basic knowledge of key contractual issues that require regular attention when planning and implementing international wind energy projects, particularly types of contracts, contractual relationships, parties involved, risks, contract contents and other key contractual aspects. **Acquired Knowledge**: Students have become familiar with the key contractual aspects, in particular, types of contracts, contractual relationships, parties involved, risks, contract contents and other important contractual matters that require regular attention when planning and implementing international wind energy projects. **Achieved Competence**: When planning and implementing international wind energy projects, students are able to identify arising contractual issues and to take them into account appropriately when planning and implementing projects of this kind.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	90 hours (5 hours of online lectures, 45 hours of self-study, 40 hours of term paper)
Study Achievements	None
Prerequisites for Admission to the Examination	None
Exam Results & Performance	Term paper (10 pages) with short presentation of the term paper (15 minutes). 75% (written term paper) and 25% (presentation) will be included in the overall grade of the module.
Number of Credits Awarded for this Module	3 credits

Additional Key Competences in Energy and Law

Module	Energy Law
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	The aim of this module is to provide students with in-depth knowledge of the legal and regulatory aspects as well as potential risks that are typically to be taken into account when planning and implementing international wind energy projects by using examples from various legal systems. **Acquired knowledge**: Students have become familiar with legal and regulatory aspects and risks that are typically to be considered when planning and implementing international wind energy projects as well as with the associated risks. **Achieved competence**: Students are able to assess the existing legal and regulatory context and to adequately take potential risks into account when planning and implementing international wind energy projects.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	90 hours (5 hours of online lectures, 45 hours of self-study, 40 hours of term paper)
Study Achievements	None
Prerequisites for Admission to the Examination	None
Exam Results & Performance	Written term paper (10 pages) with short presentation of the term paper (15 minutes). 75% (written term paper) and 25% (presentation) will be included in the overall grade of the module.
Number of Credits Awarded for this Module	3 credits

Additional Key Competences in Energy and Law

Module	Planning and Construction of Wind Turbines and Wind Farms
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	By the end of this module, students will be able to conduct wind farm micrositing with all the available (project) data, while taking into account local conditions and other constraints. Students will have acquired the ability to assess various conditions and constraints during the planning process and to derive appropriate solutions. In addition, students will know what the infrastructure of wind farms is designed and how they are built and erected.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	90 hours (15 hours of online lectures, 30 hours of self-study, 45 hours of term paper)
Study Achievements	None
Prerequisites for Admission to the Examination	None
Exam Results & Performance	Written term paper (15 pages) and short presentation of the term paper (20 minutes) and oral examination (10 minutes). 50% (written term paper) and 20% (presentation) and 30% (oral examination) will be included in the overall grade of the module.
Number of Credits Awarded for this Module	3 credits

Additional Key Competences in Energy and Law

Module	On- and Offshore Occupational Safety
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	This module aims to provide students with an understanding and knowledge of existing legal and regulatory requirements for wind energy projects based on the current state of the art. They will be aware of the occupational and environmental protection regulations as well as of the applicable laws that are to be complied with when developing offshore wind energy projects. **Acquired knowledge**: By the end of this module, students will be aware of, and able to incorporate legal and regulatory requirements into wind energy projects at every stage of their development before implementing these requirements. **Achieved competence**: By the end of this module, students will be able to identify general requirements in existing legal and regulatory provisions, to incorporate them into project management activities before implementing these requirements.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	90 hours (10 hours of online lectures, 60 hours of self-study incl. exercises)
Study Achievements	None
Prerequisites for Admission to the Examination	None
Exam Results & Performance	Multiple choice test (20 minutes)
Number of Credits Awarded for this Module	3 credits

Additional Key Competences in Energy and Law

Module	Project Management
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	By the end of this module students, will be able to develop suitable structures for running a wind farm project as a whole or split in individual sub-projects. Students will also be able to adapt these plans to the needs and circumstances of project changes. Sub-projects may include site selection, development, environmental impact assessment, tendering, construction, operation and maintenance. Students will be familiar with all the tasks involved in sub-projects and learn how to manage them.
Course Types	BL and/or EL
Prerequisites for Participating in the Module	Enrollment in the Wind Energy Systems study program
Student Workload	90 hours (15 hours of online contact study, 45 hours of self-study, 30 hours of exercises)
Study Achievements	None
Prerequisites for Admission to the Examination	None
Exam Results & Performance	Written term paper (15 pages) and presentation of the outcome as well as oral exam (on general knowledge and written term paper) (10 minutes). 50% (written term paper) and 20% (presentation) and 30% (oral exam) will be included in the overall grade of the module.
Number of Credits Awarded for this Module	3 credits

Additional Key Competences in Energy and Law

Module	Study Trip Week
Type of Module	Mandatory Elective Module
Learning Outcomes, Competences, Qualification Goals	*The excursion week is intended to enable international online students to become familiar with the institutions involved in the course (University of Kassel, Fraunhofer IEE, Fraunhofer IWES) as well as with the German wind industry. Students will get insight into various research fields pertaining to wind energy system technology. By visiting industrial locations and attending a major trade fair, students will also be given practical insight that will show them new career prospects. In their final reports, students will reflect on the experiences they have made that will be relevant for their future careers.*
Course Types	*EX*
Prerequisites for Participating in the Module	*Enrollment in the Wind Energy Systems study program*
Student Workload	*90 hours* *(40 hours on site (excursion week), 50 hours of self-study for the report and final presentation)*
Study Achievements	*None*
Prerequisites for Admission to the Examination	*None*
Exam Results & Performance	*Report (10 pages) with subsequent discussion and presentation of the report (30 minutes). 75% (project report) and 25% (subsequent discussion and presentation) will be included in the overall grade of the module.*
Number of Credits Awarded for this Module	*3 credits*

Master's Thesis

Module	Master's Thesis and Colloquium
Type of Module	Mandatory Module
Learning Outcomes, Competences, Qualification Goals	The purpose of writing a thesis is to show that a student is able to solve a scientific and a practical problem pertaining to the subject studied within a given period of time by applying scientific methods and specialist knowledge.
Course Mode	KO, BL and/or EL
Requirements for participating in the module	Enrollment in the Wind Energy Systems study program
Student Workload	450 hours, time for completion: 6 months or part-time, 12 months
Study Achievements	None
Language	English
Prerequisites for Admission to the Examination	Successful completion of at least 78 credits
Exam Results & Performance	Written thesis and presentation of the student's own research work during a colloquium (30-45 minutes). Exam results will be included in the overall grade of the module, i.e. 80% (thesis) and 20% (colloquium).
Number of Credits Awarded for this Module	30 credits

Abbreviations: Course Types

BL	Blended learning
EL	E-learning
EU	Individual lessons (music, art)
EX	Excursion
K	Course
KLU	Small group lessons (music, art)
KO	Colloquium
KÜ	Conversation exercises
LFP	Teaching research project
P int./ext.	Internship (internal / external)
PS	Project lectures
S	Lectures
SPS	Practical school studies
SU	Instruction lectures
T wiss./stud.	Tutorial (by academic staff / student assistant)
Ü	Exercise
VL	Lecture without course-related examination
VL+P	Lecture with course-related examination