

Hessen: ISU Course Outline

Engineering Science of Wind Energy Systems - Fundamentals, Technology and Practical Investigations

CLASS HOURS: 20+tutorial

Lectures	12 hours (credited)
Tutorial	2x2 hours (not credited)
Field Trips	2x2 hours (credited)
Excursion	1x4 hours (credited)

PROFESSOR (Academic Director)

Prof. Dr.-Ing. habil. Detlef Kuhl

- Office: *Mönchebergstraße 7; D-34125 Kassel* - Office hours: *by appointment*
- Email: *kuhl@uni-kassel.de* - Phone: *+49 561 804-1815*

Lecturers:

- **Dr. rer. pol. André Bisevic** is Coordinator of the advanced study program - Wind Energy Systems Online at the University of Kassel and the Fraunhofer Institute for Energy Economics and Energy System Technology (IEE)
- **Dr. -Ing. Doron Callies** is Lecturer of the advanced study program - Wind Energy Systems Online at the University of Kassel and Research Assistant at Fraunhofer Institute for Energy Economics and Energy System Technology
- **Dipl. -Ing. Stefan Faulstich** is Lecturer of the advanced study program - Wind Energy Systems Online at the University of Kassel and Group Lead at Fraunhofer Institute for Energy Economics and Energy System Technology
- **Dipl. -Ing. Berthold Hahn** is Lecturer of the advanced study program - Wind Energy Systems Online at the University of Kassel and Department Head at Fraunhofer Institute for Energy Economics and Energy System Technology
- **Prof. Dr.-Ing. Siegfried Heier** is Lecturer of the advanced study program - Wind Energy Systems Online at the University of Kassel. He is a pioneer of wind energy and author of famous text books about wind energy
- **Prof. Dr.-Ing. habil. Detlef Kuhl** is Director of the advanced study program - Wind Energy Systems Online, head of chair of Mechanics and Dynamics and Dean of Students at the Faculty of Civil and Environmental Engineering, University of Kassel
- **Prof. rer. nat. habil. Andreas Meister** is Director of the certificate study program - Scientifically Oriented Fundamentals of Wind Energy Systems and head of chair of Applied Mathematics at the Faculty of Mathematics and Natural Sciences, University of Kassel
- **Prof. Dr.-Ing. habil. Andreas Ricoeur** is Academic Director of the certificate study program Structural Mechanics of Wind Energy Systems, Head of Chair of Mechanics / Continuum Mechanics and Dean of Students at the Faculty Mechanical Engineering, University of Kassel
- **Prof. Dr. -Ing. Kurt Rohrig** is Academic Director of the certificate study program Integration of Wind Power in the Electricity Supply System at the University of Kassel and Vice-Director at Fraunhofer Institute for Energy Economics and Energy System Technology
- **Annika Schmitt M.A.** is Coordinator of the advanced study program - Wind Energy Systems Online at the University of Kassel
- **Prof. Dr. -Ing. habil. Ingo Stadler** is Lecturer of the advanced study program - Wind Energy Systems Online at the University of Kassel and Professor of Cologne Institute for Renewable Energy (CIRE) at TH Köln
- **Prof. Dr. -Ing. Jan Wenske** is Lecturer of the advanced study program - Wind Energy Systems Online at the University of Kassel and Vice-Director at Fraunhofer Institute for Wind Energy Systems
- **Dr. -Ing. Arne Wessel** is Lecturer of the advanced study program - Wind Energy Systems Online at the University of Kassel and Research Assistant at Fraunhofer Institute for Energy Economics and Energy System Technology
- **Prof. Dr.-Ing. habil. Olaf Wünsch** is Academic Director of the Certificate study program Fluid Mechanics of Wind Energy Systems, head of chair of Fluid Mechanics, University of Kassel

1) INFORMATION ON THE COURSE CONTENT

COURSE DESCRIPTION

There has never been so much wind power than today. It has increased to 51 GW worldwide. This is one reason why manufactures, service providers and evaluators require highly qualified employees with specific skills in wind energy. The University of Kassel and the Fraunhofer Institute for Energy Economics and Energy System Technology (IEE) registered this development several years ago. Therefore, these two partners established an advanced study program – Wind Energy Systems Online (wes.online). The summer university course ‘Engineering Science of Wind Energy Systems – Fundamentals, Technology and Practical Investigations’, on campus, is a part of the above mentioned master programme, introduces the main aspects of the technology and operation of wind turbines and wind farms. Furthermore, fundamentals of mechanical and electrical engineering are included. This fundamental knowledge is enhanced by laboratory studies at the University of Kassel and Fraunhofer IEE and excursions to wind farms, wind industry and wind research institutes.

LEARNING OBJECTIVES

The interdisciplinary seminar is built around a series of lectures concerned with wind energy systems (WES), delivered by professors from diverse disciplines. Students learn from and are inspired by leading academics working at the forefront of their fields. All lectures are additionally attended by tutors who supervise the students throughout the series. These tutors also accompany the students on field trips and help them prepare for the final exam.

COURSE MATERIALS

- All material will be available for download on the internet learning environment of the course.

TENTATIVE CLASS SCHEDULE

Day	Topic	Structure and assignments	Assignment due	Lectures
1	Introduction: History and Potentials of Wind Energy	Presentation Discussion Recommendations for post-course work to reinforce understanding	Post-course work on the basis of course materials Preparation for the next session	Dr. rer. pol. André Bisevic, Annika Schmitt M.A. and Prof. Dr. Detlef Kuhl
2	Design of Mechanical and Electrical Components of WES	Presentation / Discussion / Post-course work recommendations	Post-course work/ Preparation for next session	Prof. Siegfried Heier

3	Fundamentals of Wind Energy Meteorology and Wind Measurement Techniques	Presentation / Discussion / Post-course work recommendations	Post-course work/ Preparation for next session	Dr.-Ing. Arne Wessels and Dr.-Ing. Doron Callies
4	Fundamentals of Fluid and Solid Mechanics of WES	Presentation / Discussion / Post-course work recommendations	Post-course work/ Preparation for next session	Prof. Dr.-Ing. habil. Olaf Wunsch and Prof. Dr.-Ing. habil Detlef Kuhl
5	Wind Energy Excursion	Excursion	Post-course work/ Preparation for next session	Dr. rer. pol. André Bisevic and Annika Schmitt M.A.
6	Fundamentals of Construction and Design of Nacelle Systems	Presentation / Discussion / Post-course work recommendations	Post-course work/ Preparation for next session	Prof. Dr.-Ing. Jan Wenske
7	Visiting University of Kassel and Fraunhofer IEE Labs	Field trip		Experts on the spot
8	Fundamentals of Technical and Economic Aspects of Grid Integration and Energy Storage	Presentation / Discussion / Post-course work recommendations	Post-course work/ Preparation for the exam	Prof. Dr.-Ing. Ingo Stadler and Prof. Dr.-Ing. Kurt Rohrig
9	Fundamentals of Computational Fluid Dynamics and Rotor Aerodynamics for WES	Presentation / Discussion / Post-course work recommendations	Post-course work/ Preparation for the exam	Prof. Dr. rer.nat. Andreas Meister, Prof. Dr.-Ing. Detlef Kuhl
10	Fundamentals of Computational Solid Mechanics and Strength Durability and Reliability for WES	Presentation / Discussion / Post-course work recommendations	Post-course work/ Preparation for the exam	Prof. Dr.-Ing. habil. Detlef Kuhl and Prof. Dr.-Ing. habil Andreas Ricoeur
11	Operation and maintenance of wind turbines	Presentation / Discussion / Post-course work recommendations	Post-course work/ Preparation for the exam	Dipl.-Ing. Berthold Hahn and Dipl.-Ing. Stefan Faulstich

2) INFORMATION ON CLASS PARTICIPATION, ASSIGNMENTS AND EXAMS

ASSIGNMENTS

- Active participation in discussions and presentations, independent study

EXAMS

- Written exam

PROFESSIONALISM & CLASS PARTICIPATION

- Regular attendance in lectures and field trips

MISSED CLASSES

- No more than 10% of the contact hours can be missed for successful completion of the class.

3) INFORMATION ON GRADING AND ECTS

ACADEMIC STANDARDS

Upon successful completion, 3 ECTS will be awarded for the class.

According to the rules of ECTS, one credit is equivalent to 25-30 hours student workload.

GRADING SCALE:

Grade		Description
15 points	1.0	<i>very good: an outstanding achievement</i>
14 points		
13 points	1.3	
12 points	1.7	<i>good: an achievement substantially above average requirements</i>
11 points	2.0	
10 points	2.3	
9 points	2.7	<i>satisfactory: an achievement which corresponds to average requirements</i>
8 points	3.0	
7 points	3.3	
6 points	3.7	<i>sufficient: an achievement which barely meets the requirements</i>
5 points	4.0	
4 points	5.0	<i>not sufficient / failed: an achievement which does not meet the requirements</i>
3 points		
2 points		
1 point		
0 points		

This course description was issued on: May 08, 2018. Program is subject to change.