HECTOR SCHOOL
Technology Business School of the KIT

## Certificate Course

# Renewable Generation & Grid Integration

The course provides focus on two aspects. Firstly, the most common renewable energy technologies such as wind energy, solar power, hydropower as well as biomass will be introduced. The introduction includes the technical design as well as the current market and economic situation. For example, in the area of wind turbine technology, aspects like aerodynamics and wind turbine design options are presented as well as aspects of wind farm design. Secondly, the course will discuss the integration of (fluctuating) renewables into power systems, which includes the discussion of grid connection aspects (grid codes) as well as power system balancing. Special focus will be placed on the integration of on- and offshore wind power into power systems.

A field trip to the wind power station in Karlsruhe will round up this certificate course.

## Course Benefits & Take Away for Participants

The participants will

- be able to understand the design of different renewable generation technologies;
- gain knowledge about economic and regulatory aspects of renewable generation;
- be able to evaluate various solutions for the design of renewable production systems;
- gain competence to understand grid integration aspects of renewable generation;
- be able to apply knowledge in certain case studies.

## Overview Course Agenda

| | Day 1 | Day 2 | Day 3 |
|---|---|---|---|
| 8 am - 1 pm | Lecture | Lecture | Lecture |
| | Lunch Break | | |
| 2 - 5:30 pm | Lecture & Case Study | Lecture & Case Study | Field Trip (Exams optional) |

Exemplary Schedule of a 3-day Certificate Course

The course objective is to provide knowledge about a wide area of renewable technologies and understand its role in the overall grid operation. The participants will learn to understand the technical design as well as the current economic conditions, including different regulators aspects, of renewables and its operation influence on power system operation. The course aims at providing the relevant knowledge for working in a future renewable energy based electricity supply industry.

## Agenda in Detail

| Day 1: | Day 2 | Day 3 |
|---|---|---|
| **Session 1: Wind Energy**<br>• Historical Development Wind & Current Status<br>• Design of Wind Turbines<br>• Environmental Aspects<br>• Wind Measurements<br>• Special Applications: Offshore Wind and Hybrid Systems<br><br>**Case Study: Homer and/or RETScreen** | **Session 2: Solar, Hydro, Geothermal and Biomass**<br>• Solar Power<br>• Hydropower<br>• Geothermal<br>• Biomass<br><br>**Case Study: Solar PV System Design** | **Session 3: Grid Integration**<br>• Basics on Grid Integration of Renewable Generation<br>• Distribution / Transmission Issues<br>• Storage / Energy System<br><br>**Field Trip** |

## Registration & Organizational Details

| | |
|---|---|
| Duration | 3 days |
| Prize | 2.495 € per participant |
| Group Size | max. 15 participants |
| Certificate | Certificate of the HECTOR School of Engineering & Management, Technology Business School of the Karlsruhe Institute of Technology (KIT) |
| Requirements | First University Degree (Bachelor or equivalent)<br>A minimum of 5 years of professional experience in the specific field of the course is recommended<br>The course can be held in German or in English – appropriate skills in the respective language are required. For international companies translators can be hired. |
| Registration | Register online via<br>www.hectorschool.kit.edu/certificate_courses.php |

For consultancy or company arrangements please contact:

**Program Consultancy**
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## Course Instructor

**Dr. Dipl.-Ing.Thomas Ackermann**
Founder and CEO of Energynautics GmbH

Dr. Ackermann is lecturer for wind and renewable energy at the Royal Institute of Technology (KTH) in Stockholm/Sweden since 2007, and within the HECTOR School as the Technology Business School of the Karlsruhe Institute for Technology (KIT) since 2014.

Participants of this course profit from his broad industry experience: In 2000 he founded the Energynautics GmbH and is still holding the position of its CEO; before he gained insights into international energy companies like e.g. the Design Power Ltd. in New Zealand or the Tacke Windtechnik GmbH in Germany.