

# Summer School: “Wind Energy, Solar Power, & Biogas Plants”

22<sup>nd</sup> August – 9<sup>th</sup> September 2016 – Kassel (Germany)

## Content

This summer school consists of three, one-week modules which successfully combine theory and practice and focus on the study of wind, solar, and biogas energy. Each module offers participants the chance to visit German manufacturers/operators and companies in the wind, solar, and biogas fields. These activities provide participants with the opportunity to discuss their topics of interest with experts, producers, and potential business partners. The training facilities used by the German Academy are some of the most up to date facilities in the Renewable Energy sector today. A high level of learning intensity and efficiency in the lectures, presentations, and exercises will enable participants to further their knowledge pertaining to renewable energy.

The **German Academy for Renewable Energy and Environmental Technology** offers the *summer School: “Wind Energy, Solar Power, & Biogas Plants”* program in cooperation with the Fraunhofer Institute for Wind Energy and Energy System Technology (IWES).

## Profile of Partner Organization



**IWES** Fraunhofer Institute for Wind Energy and Energy System Technology (IWES) is one of the largest and most well-known German research institutes in the field of renewable energy. It has two main thematic areas, wind energy (IWES, Northwest) and energy system technology (IWES, Kassel). IWES in Kassel conducts research primarily in the field of energy system technology for the integration of renewable energy such as wind, solar and bio energy into supply structures. The current focus is on the transformation of the German energy system. In its two offices in Kassel and Bremerhaven, Fraunhofer IWES has a team of 500 scientists, engineers, non-technical staff, and students.



## **Target Group**

Engineers, technicians, professionals, decision makers, experts, academic scholars, industry newcomers and practitioners of manufacturers, suppliers, operators, developers and investors in the renewable energy sector with basic knowledge about electrical engineering or/and mechanical engineering.

## **Course Objectives**

Knowledge – After the course, the participants will have an understanding of the following topics:

## **Summer School**

The overall objective of this short term course is to give an overview of the main aspects that have to be taken into account for assessing projects in the field of renewable energy. The technologies of wind energy, photovoltaic energy, and bio energy will be discussed under technological, financial, resource assessment, and project management aspects. Visits of important manufacturers and plants of the relevant sectors will complement the theoretical training.

## **1. Wind Energy**

The first module is dedicated to wind energy. What are the different technologies used in wind turbines, and what are their advantages and disadvantages? How much wind do we have? How can we connect our wind farm to the grid? Resource assessment and grid connection are two aspects of the project cycle which will be presented and discussed in more detail, since they are the most important aspects of a successful project.

You will receive a short introduction to the leading software tool for wind farm planning. A field trip to one of the most successful manufacturers worldwide of wind turbines will give insight into producing and assembling the components, and will show the biggest onshore wind turbine with a performance of 7.5 MW. A visit of a wind farm with access to a wind turbine (AN Bonus 1.3, Siemens Company) complements the lessons - an outstanding experience, not only interesting for wind energy experts, but for everyone.

## 2. PV Solar Power

This week long module covering PV solar power continues with the basics of PV technology, as well as the resource assessment, planning, and managing of PV projects. We give a professional overview of the whole PV project life cycle: location decision, energy yield assessment, technology and construction, operation, and maintenance.

A field trip to one of the most successful manufacturers of inverters will show an impressive on-grid, but indeed autonomous, academic building which offers the possibility of viewing modern PV components. A visit from an operator who operates and maintains different large scale solar fields with roof-top as well as tracker systems will complement the photovoltaic lessons.

## 3. Biogas plants

In the third module we will give attention to the fundamentals of biogas production and upgrading and the economic aspects with a focus on co-digestion. We will introduce the success of the German biogas market, show the future perspectives of biogas, and do exercises in a biogas plant designed to apply the newly gained knowledge. A visit from an internationally well-known manufacturer and operator will give insight in operating different plants and their technology.

One and a half days of field trips complement the course program, with visits to a medium sized waste water treatment plant and various plants for utilisation of organic waste producing biogas.



## Certificate

A certificate of participation will be handed out to those who have attended at least 90% of the summer courses, upon completion of the program.

## Venue

German Academy's classroom at Fraunhofer IWES, in Kassel, Germany

## Registration Procedure

For registration, please fill out the attached form and send it along with your updated CV to the address located under the *Registration and Contact Information* section. Please specify that you wish to join our summer school *August /September 2016*. Within a few days you will know if your application has been accepted.



### Application and Payment Finalization Deadlines:

1- For Non-EU participants who need a visa to enter Germany: **30.05.2016.**



2- For EU participants or participants who have a visa to enter Germany: **30.06.2016.**

**Space is limited. Register early to avoid disappointment!**

**It is highly recommended that Non-EU participants who need a visa to enter Germany apply at least 3 months before your desired arrival date!**

## Schedule:

### Module 1: Wind Energy - Kassel



*Mon, 22 Aug.	Tue, 23 Aug.	Wed, 24 Aug.	Thu, 25 Aug.	Fri, 26 Aug.	Sat, 27 Aug.	Sun, 28 Aug.
<b>Introduction to Summer School</b> ➤ Organisation and Content <b>Fundamentals of Wind Energy</b> ➤ History, development and current use of Wind Power, future perspectives, technical and physical basics, wind energy technology concepts and components, ➤ Wind energy market and manufacturers <b>Introduction to the wind farm planning tool WindPRO</b>	<b>Resource Assessment</b> ➤ Wind resource and wind measurement, quality assessment and data evaluation, long term correlation, ➤ remote sensing – focus on LiDAR, turbine suitability analysis	 <b>Site Tour to a Manufacturer of Wind Power Plants</b> ➤ Company Enercon in Magdeburg ➤ Production line of components, manufacturing of generators and rotor blades, sub-assembly of wind turbines, ➤ Visit to Enercon Wind Power Plant (E-126, 7,5 MW)	<b>Planning and Managing Wind Energy Projects</b> ➤ Site selection, energy yield probability ➤ Development and construction, operation and maintenance, ➤ Decommissioning and repowering ➤ Basics of economics and project financing ➤ Planning: overview of necessary contracts, contract negotiation, ➤ Investment and operational costs during wind farm phases, cost structures and revenues, risk assessment	 <b>Site Tour to a Wind Power Plant</b> ➤ Wind turbine climbing of AN Bonus 1.3 (Siemens) after safety instructions ➤ Grid connection of wind farms ➤ Systems configuration overview, grid codes, design of a grid layout (cable cross section) ➤ Certificates, feedback	<b>Optional:</b> Guided sight seeing tour in Kassel– city of “Dokumenta”  Time for shopping	<b>Free time</b>

\*Please arrange your arrival on Sunday, August 21<sup>st</sup>. In the evening, the German Academy will welcome you and brief you on the program.









## Module 2: Solar Energy - Kassel

Mon, 29 Aug.	Tue, 30 Aug.	Wed, 31 Aug.	Thu, 01 Sept.	Fri, 02 Sept.	Sat, 03 Sept.	Sun, 04 Sept.
<b>Fundamentals of PV Technology I</b> <ul style="list-style-type: none"> <li>➤ Introduction to PV electricity generation</li> <li>➤ Technological concepts of PV power plants</li> <li>➤ Energy meteorology solar</li> </ul>	<b>Fundamentals of PV Technology II</b> <ul style="list-style-type: none"> <li>➤ Measurement of characteristic curves</li> <li>➤ Calculations on the design and optimization of grid connected PV-Systems (group exercises)</li> </ul>	 <b>Site Tour to a Manufacturer of the Solar Power Branch:</b> <ul style="list-style-type: none"> <li>➤ SMA Solar Technology AG Kassel: business fields, examples of installed PV power plants</li> <li>➤ PV systems components and PV power plants, technology and design of inverters, basic set up of grid connected PV systems</li> <li>➤ Visit of laboratories and production facilities</li> </ul>	<b>PV Project Planning</b> <ul style="list-style-type: none"> <li>➤ Overview of project planning phases: location decision, legal aspects, stakeholders, energy yield assessment, technology and construction, operation and maintenance,</li> <li>➤ Solar investments, economic assessment and financing: costs of components, the total investment and operation, project cash flows and validation, risk assessment and risk mitigation, quality assurance</li> <li>➤ <b>Case Study</b></li> </ul>	 <b>Field Trip to Manufacturer and Solar Fields</b> <ul style="list-style-type: none"> <li>➤ Field trip to manufacturer and solar fields</li> <li>➤ Visit to Kirchner Solar Group GmbH, Alheim</li> <li>➤ Business fields, planning aspects from an international operator's point of view</li> <li>➤ Site tour to various solar fields</li> <li>➤ Roof-top systems at company</li> <li>➤ Solar field Münzelsberg: Tracker Systems</li> <li>➤ Solar field Aua: open area plant on pillars</li> </ul> <p><b>Certificates, Feedback</b></p>	<b>Optional:</b> <p>Guided sight seeing tour in Kassel, Hillside Park Wilhelmshöhe - <b>UNESCO World Heritage Site</b></p> <p>Time for shopping</p>	<b>Free time</b>

### Module 3: Biogas Plants - Kassel

Mon, 05 Sept.	Tue, 06 Sept.	Wed, 07 Sept.	Thu, 08 Sept.	*Fri, 09 Sept.	Sat, 10 Sept.
<b>Fundamentals of Biogas Production</b> <ul style="list-style-type: none"> <li>➤ Energy production, components of biogas plants</li> <li>➤ Digestate, process failures</li> <li>➤ Energy conversion technology in WWTPs</li> <li>➤ Digester, biogas storage, instrumentation and control</li> <li>➤ Combined Heat Power Plants (CHP)</li> <li>➤ The German Biogas Market</li> <li>➤ State-of-the-art and future challenges, impact of "green energy"</li> </ul>	<b>Economic Aspects</b> <p>Investments, calculation of costs and revenues, return on investments</p> <ul style="list-style-type: none"> <li>➤ Exercise: costs and revenue of a municipal biogas plant with co-digestion</li> <li>➤ Biogas upgrading</li> <li>➤ Technology overview of biogas upgrading</li> </ul>  <p><b>Site tour</b> to Waste Water Treatment Plant Kassel (medium-sized)</p>	 <p><b>Site Tour to Viessmann Werke GmbH &amp; Co. KG, Allendorf</b></p> <ul style="list-style-type: none"> <li>➤ Planning aspects from an international operator's point of view</li> </ul>  <p><b>Site Visit of Various Plants for Utilization of Organic Waste:</b></p> <ul style="list-style-type: none"> <li>➤ Dry fermentation and composting, wet fermentation with biogas production and upgrading, power-to-gas, thermal exploitation of biomass incl. power generation</li> </ul>	<b>Biogas Plant Design - Exercise</b> <ul style="list-style-type: none"> <li>➤ Guided group work to design a small scale biogas plant</li> </ul> <b>Future Perspectives of Biogas</b> <ul style="list-style-type: none"> <li>➤ as a renewable energy source</li> <li>➤ as a storable energy carrier</li> <li>➤ for flexible energy production</li> <li>➤ for modern energy supply</li> </ul> <b>Certificates, Feedback</b>	<b>Optional: Sightseeing tour / culture programme</b> <p>Get together for an exchange experience &amp; contact with other international participants and discuss RE projects and Business Ideas.</p> <p><b>Time for shopping</b></p> <p><b>Goodbye</b></p>	<b>Departure</b> 

## Suggested Accommodation in Kassel

### 1- Hotel Chassalla.

This **3-star hotel** is in a quiet location in the heart of Kassel, and benefits from easy access to public transportation. A tram stop is just a short walk away. The Hotel Chassalla takes its name from Kassel's medieval name, Chassella. It offers comfortable, well-equipped rooms. Thanks to the hotel's convenient location, you can easily reach the Bergpark, with its famous statue of Hercules atop the Oktagon, the Fridericianum museum and the middle of the city.

The Hotel Chassalla has 44 rooms with 77 beds, each room has shower or bath-tub/WC, hair dryer, (nail file, sewing case, comb, shaving and mouth care set available at the reception), telephone, colour television set with cable connection, radio, sound-isolated window, desk with halogen bulb, with mini bar (if desired), free of charge internet access with WiFi in all guest rooms and public areas. We can book a single room for you which includes a rich breakfast buffet. Lunch and dinner are not included in the price, but are available at the hotel for an extra charge.

The Hotel Chassalla is only an 8 minute walk from the Fraunhofer IWES institute, where the course will take place. For more information about the hotel check out the link below:

<http://www.hotel-chassalla.de/inhalte/english/index.html>





## 2- City Hotel, Kassel City Centre.

The **City Hotel** is a three-star hotel centrally located in Kassel close to the historical Allee, approximately a 5 minute walk from the German Academy's classroom at Fraunhofer IWES, where the course will take place. With friendly and attentive staff, the City Hotel's atmosphere ensures that guests feel well looked after so that they can begin their day rested and relaxed.

We can book for you a single standard/economy room. A generous breakfast buffet, WLAN access, and access to the hotel's wellness area are included in your room price. Rooms are furnished with a bath/shower, toilet, hairdryer, cable TV, telephone, mini bar, and a living room area with desk. Lunch and dinner are not included in the price, but are available at the hotel for an extra charge.

For more information check out the website: <http://www.city-hotel-kassel.de/en/index.php>



## Where to eat on a budget in Kassel

The University of Kassel offers a nice canteen and cafeteria to both students and the public, where you can get breakfast, lunch, and drinks at a reasonable price. The university cafeteria is only a 5-minute walk from the German Academy's classroom at Fraunhofer IWES, where the course will take place. For meal prices please check out the links below:

<http://www.studentenwerk-kassel.de/?id=189>

<http://www.studentenwerk-kassel.de/index.php?id=203&L=1>

## Kassel – the City of Energy

Kassel, the “Capital of the German Fairy Tale Route” is a city with 200,000 residents in the region of North Hessen, which is located in the centre of Germany. This region is known for its high-performing small and middle-sized firms as well as for its innovative companies, who are among the world’s best developers of new environmental technologies. The University of Kassel, founded in 1970, offers high standard teaching and research activities and attracts more than 22,000 students from over 100 countries worldwide. Kassel combines the quiet cosiness of a green city with beautiful parks and the Fulda River, with the vibrancy of its art scenes and academic life. During the *Wind Energy and Solar Power* programs, the German Academy will organize guided sightseeing tours, giving participants the chance to explore the city of Kassel for themselves. [Read more!](#)



23 June, 2013 the Mountain Park and Herkules, in Kassel were proclaimed as a world heritage site during the UNESCO meeting in Phnom Penh.

## Fees

1. A fee of \***EUR 3100** covers tuition fees for the summer school “*Wind Energy, Solar Power, & Biogas Plants,*” course materials, documentation, site tours, coffee breaks & fruit, and a programme certificate.

**Early bird price: book before 30<sup>th</sup> of April 2016 and pay only \*EUR 2900!**

2. A fee of \***EUR 4200** covers tuition fees for the summer school “*Wind Energy, Solar Power, & Biogas Plants,*” course materials, documentation, site tours, coffee breaks & fruit, a programme certificate, accommodation with a breakfast buffet, in a single room at the **Hotel Chassalla**\*\*\* (20 nights).

**Early bird price: book before 30<sup>th</sup> of April 2016 and pay only \*EUR 4000!**

3. A fee of **EUR 4500** covers tuition fees for the summer school “*Wind Energy, Solar Power, & Biogas Plants,*” course materials, documentation, site tours, coffee breaks & fruit, a programme certificate, accommodation in a single room with a generous breakfast buffet, WLAN access, and access to the hotel’s wellness area at the **City Hotel** (20 nights).

**Early bird price: book before 30<sup>th</sup> of April 2016 and pay only \*EUR 4300!**

\* All the above prices are per person!

\*\* Group rates available for a minimum of 5 participants. Ask us for more details!

\*\*\*In all hotels the option is available to share a double room. If you book as a 2, then please specify if you would like to share a room and with which participant on your registration form. Ask us for more details!

\*\*\*\*Lunch, dinner and drinks are not included in your room price. However, they are available at either hotel at an extra cost!

**Payment in instalments is possible in certain cases, please contact us for further information!**

## Letter of Invitation/VISA

We welcome international participants worldwide to take part in our programme. If you need a visa to enter the Federal Republic of Germany, we will gladly support you through the process by sending both you and the German embassy in your home country an invitation letter to support your visa application. The invitation letter/certificate for obtaining a visa will be issued by either the German Academy or a partner organization, once the minimum number of participants has been met and payment of the course fee has been received. All costs associated with the visa process, including the cost of the invitation letter, delivery fee to participants through a courier service such as DHL or EMS, delivery fee to the German embassy, as well as all other fees associated with obtaining a visa must be paid for by the participants themselves. Please keep in mind the time needed for the entire visa process, as it may take up to three months to obtain in some countries. Please contact us as soon as possible if you would like us to support you through the process.

*\*\*The costs associated with obtaining a visa are not included in the total amount stated under the fees section and are an additional cost. \*\**

## Registration and Contact Information

The German Academy of Renewable Energy and Environmental Technology

Kaiser-Friedrich-Str. 4a, 10585 Berlin, Germany

E-mail: [info@germanacademy.net](mailto:info@germanacademy.net)

Web: [www.germanacademy.net](http://www.germanacademy.net)

Phone: +49 (0)30 33 77 80 33

Mobile: +49 (0)173 83 90 318

Fax: +49 (0)30 63 42 6227



# Education Course Registration Form



## GERMAN ACADEMY

For Renewable Energy And Environmental Technology

I want to book for the following course (please select your choice):

☐ Summer School “Wind Energy, Solar Power, & Biogas Plants”

**Date: 22 August - 09 September 2016**

**Location:** – Kassel- (Germany)

☐ **Wind Energy** – 22- 27 August 2016 - Kassel

☐ **Solar Power** – 29 August - 03 September 2016 - Kassel

☐ **Biogas Plants** –15-19 September 2016 - Kassel

**Course Language: English**

**Fee** (varies according to accomadiations): \_\_\_\_\_

**Register EARLY— Attendance is limited!**

**Please fill out the form clearly in capital letters. All fields must be carefully filled in and the document must be signed.**

**Incomplete forms will not be considered.**

### Application and Payment Finalization **Deadlines:**

1- For Non-EU participants who need a visa to enter Germany: **30.05.2016.**

2- For EU participants or participants who have a visa to enter Germany: **30.06.2016.**

First Name: \_\_\_\_\_ Last Name: \_\_\_\_\_

Date of Birth (day/mo/yr)(required): \_\_\_\_\_ Gender: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ Zip Code: \_\_\_\_\_ Country: \_\_\_\_\_

Nationality: \_\_\_\_\_ E-mail address: \_\_\_\_\_

Degree: \_\_\_\_\_ Major: \_\_\_\_\_

Institute/ Organization: \_\_\_\_\_ Work Experience: \_\_\_\_\_

Function: \_\_\_\_\_ Title: \_\_\_\_\_

Phone Number: \_\_\_\_\_ Work Phone Number: \_\_\_\_\_

I hereby confirm that arrangements for payment for the abovementioned course delegate are in place, and agree to the payment procedures and terms and conditions as outlined on: [www.germanacademy.net](http://www.germanacademy.net)

By signing this registration form, I hereby confirm my participation by agreeing to all German Academy terms and conditions.

**Signature:**

**Date:**

**Location:**

(Only handwritten signature is acceptable)

**Please send the completed registration form by post/fax/e-mail to:**

**German Academy of Renewable Energy and Environmental Technology**

Mr. Hossam Gamil,

The Director of Educational Programs for Renewable Energies & Environment.

Kaiser-Friedrich-Str. 4 A, 10585 Berlin

Fax: +49 30- 63426227

Tel: +49 30 - 33778033 or +491738390318

E-mail: [info@germanacademy.net](mailto:info@germanacademy.net)