



Fraunhofer
ACADEMY

MADE IN GERMANY

FORMACIÓN AVANZADA EN ENERGÍAS RENOVABLES





ENTRENAMIENTO INNOVADOR CREADO POR FRAUNHOFER

Fraunhofer-Gesellschaft es la organización líder para la investigación aplicada en Europa. Sus actividades de investigación están a cargo de 72 institutos y unidades de investigación en toda Alemania y en numerosos lugares internacionales. Fraunhofer-Gesellschaft cuenta con más de 26.600 empleados, que trabajan con un presupuesto anual de investigación que asciende a 2.300 millones de euros. Las colaboraciones internacionales con excelentes socios de investigación y empresas innovadoras en todo el mundo garantizan el acceso directo a las regiones de mayor importancia para el progreso científico y el desarrollo económico presente y futuro. “Energía y sustentabilidad” es una de las principales áreas de investigación de Fraunhofer. Dentro de esta área, la energía renovable juega un papel importante en los proyectos de investigación internacional y programas educativos.

Fraunhofer Academy es el proveedor especializado de Fraunhofer-Gesellschaft de educación continua y capacitación. En cooperación con socios de renombre y universidades asociadas, ofrece programas de estudio a tiempo parcial, cursos certificados y seminarios de varios días. Fraunhofer Academy transfiere el conocimiento y la experiencia en investigación de los Institutos Fraunhofer a las empresas e instituciones que buscan brindar a sus empleados las mejores calificaciones posibles. Después de todo, la investigación aplicada es útil solo si las nuevas investigaciones encuentran su camino en la industria y luego se convierten en innovaciones. Esta es la única forma en que las empresas pueden seguir siendo competitivas en el mercado global.

Latinoamérica ha sido un lugar de investigación para los institutos Fraunhofer durante muchos años. En Chile, la **Fundación Fraunhofer Chile Research** fue fundada en 2010 y ahora consta de dos institutos de investigación. En Brasil, se han fundado **Fraunhofer Liaison Office Brazil** y tres centros de proyecto desde 2012.

Beneficios de nuestro entrenamiento avanzado:

- Estudie online desde cualquier parte del mundo: forme parte de un grupo internacional de profesionales
- Trabaje y estudie simultáneamente y equilibre su tiempo de estudio y familiar
- Aprenda de los principales expertos de Alemania en la industria, la investigación y el desarrollo
- Forme parte de una red internacional en el área de las energías renovables
- Adquiera habilidades prácticas para avanzar en su carrera y aplicar lo aprendido directamente a su trabajo
- Obtenga una Maestría en Ciencias totalmente acreditada o un Certificado de Estudios Avanzados de una universidad alemana
- Disfrute del aprendizaje flexible con tutorías personalizadas
- Lleve a cabo los cursos internacionales en inglés

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ONLINE MASTER OF SCIENCE WIND ENERGY SYSTEMS

WIND ENERGY CONVERTER SYSTEMS

Further Information

Format

E-learning: 100% online
Language: English

Starting date

October every year

Duration

7 semesters (part-time)

Course fee

€ 14,000 total (120 credits)

Qualification

Master of Science (M.Sc.)

Application

www.uni-kassel.de/wes

Program overview

The main objective of the master program for Wind Energy Systems is capacity building in the field of wind energy for research and industry with the experience of wind power research conducted by a unique education alliance: the University of Kassel, Germany's leading university for sustainability as well as the Fraunhofer Institute for Wind Energy and Energy System Technology, part of Europe's leading research institute Fraunhofer. The program also establishes learning alliances with industrial companies.

Our study program gives the opportunity to become an expert for future leading aspects like:

- How to manage the technical or economic integration of a large amount of wind energy into the energy supplier system?
- How to design and develop innovative concepts for the single components of the wind energy converter system, like the nacelle system, the rotor blade or the support structures?

Who should enroll

Target groups for the master program are natural scientists and engineers who hold a bachelor's degree and wish to extend their knowledge in the field of wind energy. The program is taught 100% online and provides professionals and career changers with on-the-job training in the emerging research and business field of Wind Energy Systems.

Key benefits

- Learn from Germany's leading experts in the industry, research and development
- Worldwide recognition of the German degree (Master of Science)
- Fully taught in English
- Study online from anywhere in the world
- Work and study simultaneously and balance your study and family time
- Close tutoring in each course of international experts in the field
- Gain access to an international network in the field of Wind Energy

Program overview

The certificate 'Wind Energy Converter Systems' is focused on engineering, planning and managing aspects of wind turbine technology, wind turbines and wind farms. It provides the knowledge about classical and recently developed wind turbine components. Design and analysis methods for modern on- and offshore foundations, towers, rotor blades and nacelle systems will be taught. Modules about planning, management, administration of wind turbines and wind parks will complete the profile of project responsible wind engineers.

You select modules with a total of 30 credits:

- Design of Mechanical and Electrical Components
- On- and Offshore Foundations
- Construction and Design of the Nacelle Systems
- Towers
- Rotor Blades
- Business Administration and Management of Wind Turbines and Wind Farms
- Planning and Construction of Wind Farms

Who should enroll

Target groups are engineers and bachelor's degree holders who wish to extend their knowledge in the field of wind energy.

Key benefits

- International certificate program with 100% of online teaching
- Study at the cutting edge of applied research in wind energy
- Solve the current and future challenges of wind energy development and be part of the world-wide increase of renewable wind energy
- Start with one certificate and use these modules for crediting to the master's program

Further Information

Format

E-learning: 100% online
Language: English

Starting date

April and October every year

Duration

12 months/2 semester

Course fee

€ 6000 (30 credits)

Qualification

Certificate from the University of Kassel in collaboration with the Fraunhofer Institute for Energy Economics and Energy System Technology IEE

Application

www.uni-kassel.de/wes



Certificate of Advanced Studies

Certificate of Advanced Studies

SCIENTIFICALLY ORIENTED FUNDAMENTALS OF WIND ENERGY SYSTEMS

ELECTRICAL ENGINEERING OF WIND ENERGY SYSTEMS

Further Information

Format

E-learning: 100% online
Language: English

Starting date

April and October every year

Duration

12 months/2 semester

Course fee

€ 6000 (30 credits)

Qualification

Certificate from the University of Kassel in collaboration with the Fraunhofer Institute for Energy Economics and Energy System Technology IEE

Application

www.uni-kassel.de/wes

U N I K A S S E L
V E R S I T Ä T

Program overview

The certificate 'Scientifically Oriented Fundamentals of Wind Energy Systems' provides a strong fundamental knowledge to understand economically and ecologically efficient wind energy transformation and to design new wind turbines or components of wind turbines beyond the state-of-the-art of wind engineering. Beside the primary improvement of fundamental engineering knowledge, this certificate also serves as a basis for more technical or methodological oriented certificates or for studying the complete 'Online M.Sc. Wind Energy Systems' program.

You select five modules from an offer of the following six modules:

- Design of Mechanical and Electrical Components
- Mathematics
- Application of Software Tools
- Solid Mechanics
- Fluid Mechanics
- Electrical Engineering

Who should enroll

Target groups are engineers and bachelor's degree holders who wish to extend their knowledge in the field of wind energy. The certificate will qualify engineers of various disciplines, natural scientists and mathematicians to adapt their competencies to wind engineering.

Key benefits

- International certificate program with 100% of online teaching
- Study at the cutting edge of applied research in wind energy
- Solve the current and future challenges of wind energy development and be part of the world-wide increase of renewable wind energy
- Start with one certificate and use these modules for crediting to the master's program

Program overview

The certificate 'Electrical Engineering of Wind Energy Systems' deals with the main components of the electrical system. Issues like how to design, control and operate the electrical system in a wind energy converter will be treated. In this context questions are answered regarding the technical challenges and boundary conditions for the design and how does it interchange with the drive train and the whole wind energy converter system and the wind farm.

The Certificate consists of the following modules:

- Design of Mechanical and Electrical Components
- Electrical Engineering
- Control and Operational Management for Wind Turbines and Wind Farms
- Energy Storage
- Technical and Economic Aspects of Grid Integration

Who should enroll

Target groups are engineers and bachelor's degree holders who wish to extend their knowledge in the field of wind energy. The certificate is recommended to engineers who want to work for manufacturers that deal with the design of the electrical system of a wind turbine or who would like to work for consultant companies that deal with the operation and maintenance of wind farms.

Key benefits

- International certificate program with 100% of online teaching
- Study at the cutting edge of applied research in wind energy
- Solve the current and future challenges of wind energy development and be part of the world-wide increase of renewable wind energy
- Start with one certificate and use these modules for crediting to the master's program

Further Information

Format

E-learning: 100% online
Language: English

Starting date

April and October every year

Duration

12 months/2 semester

Course fee

€ 6000 (30 credits)

Qualification

Certificate from the University of Kassel in collaboration with the Fraunhofer Institute for Energy Economics and Energy System Technology IEE

Application

www.uni-kassel.de/wes

U N I K A S S E L
V E R S I T Ä T



COMPUTATIONAL WIND ENERGY SYSTEMS

INTEGRATION OF WIND POWER IN THE ELECTRICITY SUPPLY SYSTEM

Further Information

Format

E-learning: 100% online
Language: English

Starting date

April and October every year

Duration

12 months/2 semester

Course fee

€ 6000 (30 credits)

Qualification

Certificate from the University of Kassel in collaboration with the Fraunhofer Institute for Energy Economics and Energy System Technology IEE

Application

www.uni-kassel.de/wes

Program overview

This certificate provides a knowledge of computational methods used for the static and dynamic analysis of wind energy converters and the surrounding wind and water flows. The goal is to enable engineers to apply existing commercial software packages of structural and fluid mechanics in a sophisticated manner as basis for reliable prognoses of the mechanical behavior of wind turbines and to improve the quality of numerical methods and to develop more realistic models of wind energy systems. These aspects are fundamental ingredients for the engineering optimization of wind turbines and their future innovative designs with a higher energy efficiency, life time, degree of capacity utilization and robustness with regard to extreme load cases.

The Certificate consists of the following modules:

- Theoretical Fluid Mechanics
- Computational Fluid Dynamic
- Linear Computational Structural Mechanics
- Non-Linear Computational Structural Mechanics

On top of that you select one module from an offer of two modules:

- Rotor Aerodynamic
- Strength Durability and Reliability

Who should enroll

Target groups are engineers and bachelor's degree holders who wish to extend their knowledge in the field of wind energy. Studying this certificate requires the successful completion of the certificate 'Scientifically Oriented Fundamentals of Wind Energy Systems'.

Key benefits

- International certificate program with 100% of online teaching
- Study at the cutting edge of applied research in wind energy
- Start with one certificate and use these modules for crediting to the master's program

Program overview

The fluctuation of wind power and the more decentralized production of wind power require complex solutions for the successful grid integration. The certificate 'Integration of Wind Power in the Electricity Supply System' gives you the opportunity to study the increasingly important issue of the integration of wind power into the power supply system. The certificate focuses on technical, administrative and legal barriers and challenges which are to be considered for a successful integration of wind power and other renewable energy and conventional technologies into the grid.

The Certificate consists of the following modules:

- Energy Meteorology
- Energy Storage
- Control and Operational Management for Wind Turbines and Wind Farms
- Technical and Economic Aspects of Grid Integration
- Energy Law
- Business Administration and Management of Wind Turbines and Wind Farms

Who should enroll

Target groups are engineers and bachelor's degree holders who wish to extend their knowledge in the field of wind energy. Studying this certificate requires the successful completion of the certificate 'Scientifically Oriented Fundamentals of Wind Energy Systems'.

Key benefits

- International certificate program with 100% of online teaching
- Study at the cutting edge of applied research in wind energy
- Solve the current and future challenges of wind energy development and be part of the world-wide increase of renewable wind energy
- Start with one certificate and use these modules for crediting to the master's program

Further Information

Format

E-learning: 100% online
Language: English

Starting date

April and October every year

Duration

12 months/2 semester

Course fee

€ 6000 (30 credits)

Qualification

Certificate from the University of Kassel in collaboration with the Fraunhofer Institute for Energy Economics and Energy System Technology IEE

Application

www.uni-kassel.de/wes



Certificate of Advanced Studies

Certificate of Advanced Studies

FLUID MECHANICS OF WIND ENERGY SYSTEMS

STRUCTURAL MECHANICS OF WIND ENERGY SYSTEMS

Further Information

Format

E-learning: 100% online
Language: English

Starting date

April and October every year

Duration

12 months/2 semester

Course fee

€ 6000 (30 credits)

Qualification

Certificate from the University of Kassel in collaboration with the Fraunhofer Institute for Energy Economics and Energy System Technology IEE

Application

www.uni-kassel.de/wes

**U N I K A S S E L
V E R S I T Ä T**

Program overview

This certificate provides a knowledge of mathematics and fluid mechanics as well as computational methods used for the fluid mechanical analysis of wind energy converters for stationary and transient cases. A strong knowledge about the aerodynamics of rotor blades will be facilitated. The goal is to enable engineers to apply existing commercial software packages of computational fluid mechanics in a sophisticated manner as basis for reliable prognoses of the fluid flow around wind turbines, and to improve the quality of numerical methods and to develop realistic models of wind energy systems. These aspects are fundamental ingredients for the engineering optimization of state-of-the-art wind turbines and their innovative designs with a higher energy efficiency, lifetime, degree of capacity utilization and robustness with regard to extreme load cases.

The Certificate consists of the following modules:

- Mathematics
- Fluid Mechanics
- Theoretical Fluid Mechanics
- Computational Fluid Mechanics
- Rotor Aerodynamics

Who should enroll

Target groups are engineers and bachelor's degree holders who wish to extend their knowledge in the field of wind energy.

Key benefits

- International certificate program with 100% of online teaching
- Study at the cutting edge of applied research in wind energy
- Solve the current and future challenges of wind energy development and be part of the world-wide increase of renewable wind energy
- Start with one certificate and use these modules for crediting to the master's program

Program overview

Studying the certificate will provide knowledge of classical, current and future numerical methods for the solution of advanced mechanical models of wind turbine structures and structural components. Engineers will be familiar with the interpretation of stress states in different materials and the consequences for structural safety and lifetime of wind turbines. The goal of the certificate is to recognize which combinations of models and numerical methods can be efficiently and trustworthily applied for special kinds of structural analyses. Also engineers will be familiar with the limitations of the models and numerical methods and they will overcome these limitations by writing their own partial programs for special tasks in their professional career.

The Certificate consists of the following modules:

- Mathematics
- Solid Mechanics
- Linear Computational Structural Mechanics
- Non-Linear Computational Structural Mechanics
- Strength Durability and Reliability

Who should enroll

Target groups are engineers and bachelor's degree holders who wish to extend their knowledge in the field of wind energy.

Key benefits

- International certificate program with 100% of online teaching
- Study at the cutting edge of applied research in wind energy
- Solve the current and future challenges of wind energy development and be part of the world-wide increase of renewable wind energy
- Start with one certificate and use these modules for crediting to the master's program

Further Information

Format

E-learning: 100% online
Language: English

Starting date

April and October every year

Duration

12 months/2 semester

Course fee

€ 6000 (30 credits)

Qualification

Certificate from the University of Kassel in collaboration with the Fraunhofer Institute for Energy Economics and Energy System Technology IEE

Application

www.uni-kassel.de/wes

**U N I K A S S E L
V E R S I T Ä T**



Part-Time Master of Science

Certificate of Advanced Studies

ONLINE MASTER OF SCIENCE SOLAR ENERGY ENGINEERING

SOLAR CELLS AND PHOTOVOLTAIC SYSTEMS

Further Information

Format

E-learning 90%, written exams, voluntary Campus Events every 6 months, Hands-on workshops (2 days), Language: English

Starting date

October each year

Duration

4–6 semesters

Course fee

based on your previous degree:
€ 12,500 (60 credits)
€ 22,500 (120 credits)

Qualification

Master of Science (M.Sc.)

Application

www.study-solar.com



Program overview

Study online – from anywhere in the world: You will gain profound insights into the physics, technology and system design of solar cells, photovoltaic systems and solar thermal devices. The program will enable you to develop, design and optimize devices and systems with respect to efficiency, cost and lifetime. Outstanding researchers from the Fraunhofer Institute for Solar Energy Systems ISE and the Albert-Ludwigs-University of Freiburg will be your teachers. The course is based on the latest scientific and technological knowledge.

Hands-on experience at Fraunhofer ISE's labs: The highlight of the program is a voluntarily campus phase offered each semester. You have the chance to meet teachers and fellow students face-to-face and experience hands-on training in Fraunhofer ISE's labs. Invited speakers from science and industry will deepen your understanding and connect you to the growing global community of solar energy practitioners. Students get the possibility to spend 6+ months for the Master Thesis on campus in Freiburg, Germany.

Who should enroll

Whether you are looking for a new career or already have a busy professional schedule, our master programme can fit around you. You can study online, at your own pace without disrupting work or family life.

Key benefits

- Graduate with a fully accredited German Master of Science degree.
- Learn from Germany's leading experts in industry, research and development.
- Study online from anywhere in the world - be part of an international student group.
- Stay in your job and study part time - take exams in study centers close to where you live.
- Become an expert in solar energy engineering and start your new career.
- Enjoy the flexibility of our program - benefit from our decade of experience in global online education.

Program overview

This certificate program condenses the expertise gained over the years to enable a substantial scientific understanding of photovoltaic energy conversion. Participants gain an overview of the overall system of photovoltaic energy conversion and a detailed scientific foundation of the underlying principles of solar cells.

- Experienced engineers will be qualified to design and optimize photovoltaic systems
- Enthusiasts will be able to understand in detail the physical principals of every kind of solar cell.

Participants will become proficient in explaining the physical and engineering principles, analyzing and assessing new solar cell concepts as well as latest trends in photovoltaics based on the fundamental principles.

Who should enroll

Studying one of our CAS programs gives you access to expert knowledge from a world-leading research institute and awards you with a certificate of one of Germany's top universities.

This CAS is an ideal choice if you bring:

- Knowledge about the energy sector, or;
- Professional experience in the photovoltaic industry

Key benefits

- Gain comprehensive knowledge about the fundamental physical processes of solar cells and photovoltaic systems.
- Understand the physics, technology and designs of solar cells.
- Learn how PV Systems are designed and optimized - for optimal energy production and storage.
- Advance your professional career by learning from Germany's leading experts in solar energy.

Further Information

Format

E-learning, voluntary Campus Phase in Freiburg, Germany
Language: English

Starting date

October each year

Duration

6 months/1 semester

Course fee

€ 2500 (10 credits)

Qualification

CAS from the University of Freiburg in collaboration with the Fraunhofer Institute for Solar Energy Systems ISE

Application

www.study-solar.com





SOLAR THERMAL ENERGY TECHNOLOGY

CRYSTALLINE SILICON PHOTOVOLTAICS

Further Information

Format

E-learning, voluntary Campus Phase in Freiburg, Germany
Language: English

Starting date

October each year

Duration

12 months/2 semesters

Course fee

€ 2500 (10 credits)

Qualification

CAS from the University of Freiburg in collaboration with the Fraunhofer Institute for Solar Energy Systems ISE

Application

www.study-solar.com

Program overview

This certificate gives a wide overview on solar thermal systems and their main components. Starting with basic issues of physical processes and design options for non-concentrating and concentrating solar thermal collectors, systems engineering based on these technologies are presented. The complex systems for different applications ranging from solar water heating to process heat for industry to solar thermal power production are described. Starting point are the basic physical principles behind this technology. All types of solar collectors are discussed. Especially Linear Fresnel collectors and solar tower heliostat fields are reviewed.

An important topic is the energy efficiency and integration of solar thermal heat in industrial processes. Aspects like hybridization of CSP with PV or the impact of different high-temperature storage options are considered.

Who should enroll

Studying one of our CAS programs gives you access to expert knowledge from a world-leading research institute and awards you with a certificate of one of Germany's top universities.

The Solar Thermal Energy Technology Certificate is an ideal program if you are a working professional with:

- Knowledge about the energy sector, or
- Professional experience in the solar thermal industry.

Key benefits

- Gain a wide overview on solar thermal systems and their main components.
- Understand all types of solar collectors – especially linear Fresnel collectors and solar tower heliostat fields are reviewed.
- Learn about hybridization of CSP with PV and understand the impact of different high-temperature storage options.
- Advance your professional career by learning from Germany's leading experts in solar energy.



Program overview

The course discusses the state-of-the-art technology for fabrication of crystalline silicon solar cell modules starting from quartz sand. Main topics are the solar cell wafer fabrication, the working principle of the Al-BSF and PERC solar cell concept, inline fabrication of solar cells and solar cell modules. The course involves necessary simulation and characterization approaches to understand the limitations of solar cell devices as well as currently discussed trends in research and technology.

Experience a two-day Lab Workshop in the high-end facilities of Fraunhofer ISE in Freiburg at the end of your course.

Who should enroll

Studying one of our CAS programs gives you access to expert knowledge from a world-leading research institute and awards you with a certificate of one of Germany's top universities.

The Crystalline Silicon Photovoltaics Certificate is an ideal program if you are a working professional with:

- Knowledge about the energy sector, or
- Professional experience in the photovoltaics industry.

Key benefits

- Get first-hand knowledge on silicon solar cell technologies from leading researchers from Fraunhofer ISE and Freiburg University.
- Explore the state-of-the-art technology for fabrication of crystalline silicon solar cells and modules.
- Understand the working principle of the Al-BSF and PERC solar cell concept.
- Experience a two-day Lab Workshop in the state of the art facilities of Fraunhofer ISE in Freiburg at the end of your course.

Further Information

Format

E-learning, mandatory workshop (2 days) in Freiburg, Germany, Language: English

Starting date

April each year

Duration

6 months/1 semester

Course fee

€ 2500 (10 credits)

Qualification

CAS from the University of Freiburg in collaboration with the Fraunhofer Institute for Solar Energy Systems ISE

Application

www.study-solar.com





Certificate of Advanced Studies

Certificate of Advanced Studies

SOLAR CELL CHARACTERIZATION AND MODELLING

PHOTOVOLTAICS AND THE RENEWABLE ENERGY GRID

Further Information

Format

E-learning, mandatory workshop (2 days) in Freiburg, Germany, Language: English

Starting date

October each year

Duration

6 months/1 semester

Course fee

€ 2500 (10 credits)

Qualification

CAS from the University of Freiburg in collaboration with the Fraunhofer Institute for Solar Energy Systems ISE

Application

www.study-solar.com

Program overview

This certificate provides practical as well as theoretical insights into common characterization techniques used for solar cell characterization. The certificate also provides an advanced understanding of multi-dimensional effects in solar cell and material characterization. Participants will also learn how a simulation package for solar cell simulation works, by providing an insight into the numerical techniques to discretize the governing equations to describe solar cells. The Software COMSOL will be used intensively.

The certificate includes a two-day laboratory course "Measurement Instrumentation" in Fraunhofer ISE's labs in Freiburg during our Campus Phase.

Who should enroll

Studying one of our CAS programs gives you access to expert knowledge from a world-leading research institute and awards you with a certificate of one of Germany's top universities.

The Solar Cell Characterization and Modelling Certificate is an ideal program if you are a working professional with:

- A good mathematical understanding, and;
- A confident handling of quantitative data and complex simulation software.

Key benefits

- Gain insights into the common characterization techniques for feedstock, solar cells and modules.
- Learn about numerical simulation of solar cell and get trained with the software COMSOL.
- Experience a two-day Lab Workshop in the state-of-the-art facilities of Fraunhofer ISE in Freiburg at the end of your course.
- Advance your professional career by learning from Germany's leading experts in solar energy



Program overview

Decentralized electricity generation and fluctuating availability pose a challenge on grid stability. This certificate provides comprehensive understanding of interaction between PV systems and the power grid. It is about control aspects of PV Systems and the integration of a huge amount of PV energy in the electricity grid. Furthermore, this certificate gives a wide overview on smart grid and renewable energy systems. Starting with basic issues of energy and efficiency, grid technology will be discussed to balance complex systems with available storage components.

Who should enroll

Studying one of our CAS programs gives you access to expert knowledge from a world-leading research institute and awards you with a certificate of one of Germany's top universities.

The Photovoltaics and the Renewable Energy Grid Certificate is an ideal program if you are a working professional with:

- Knowledge about the energy sector and
- A solid background in Electrical Engineering

Key benefits

- Gain comprehensive understanding of the complex interactions between photovoltaic systems and the power grid.
- Learn about control aspects of PV Systems and the integration of a huge amount of PV energy in the electricity grid.
- Understand smart grids and energy autonomous communities.
- Advance your professional career by learning from Germany's leading experts in solar energy.

Further Information

Format

E-learning, preparation of a handout and final oral presentation, Language: English

Starting date

April each year

Duration

6 months/1 semester

Course fee

€ 2500 (10 credits)

Qualification

CAS from the University of Freiburg in collaboration with the Fraunhofer Institute for Solar Energy Systems ISE

Application

www.study-solar.com





Certificate of Advanced Studies

Certified Training Course

ADVANCED SOLAR CELL TECHNOLOGIES

PV QUALITY ASSURANCE SPECIALIST

Further Information

Format

E-learning, preparation of a handout and final oral presentation, Language: English

Starting date

October each year

Duration

6 months/1 semester

Course fee

€ 2500 (10 credits)

Qualification

CAS from the University of Freiburg in collaboration with the Fraunhofer Institute for Solar Energy Systems ISE

Application

www.study-solar.com

Program overview

This certificate provides a comprehensive understanding of the different types (Si-based, CIGS, and CdTe) of thin-film solar cells, modules and their production. Participants will be able to understand the role of thin-film solar cells in the PV market and the specific applications in which they excel. They will also be able to assess present and future novel photovoltaic concepts.

Participants gain a wide overview about existing concepts to overcome the thermodynamic limit for single junction solar cells, the so-called third generation photovoltaics. New techniques in solar cell production which originate from the related fields of microsystems engineering and nanoscience will be introduced. The processes introduced are likely to concern photovoltaic engineers in an upcoming 10-year period.

Who should enroll

Studying one of our CAS programs gives you access to expert knowledge from a world-leading research institute and awards you with a certificate of one of Germany's top universities.

The Advanced Solar Cell Technologies Certificate is an ideal program if you are a working professional with:

- A good understanding of the physical principles of solar cells

Key benefits

- Gain a comprehensive understanding of the different types of thin-film solar cells, modules and their production.
- Understand III-V solar cells and concentrator systems.
- Get an overview on the different kinds of new types of solar cells like organic and perovskite.
- Learn about new techniques in solar cell production which are likely to concern a PV engineer in an upcoming 10-year period.

Program overview

The principal focus in this seminar is the assurance of technical quality as well as economic decision making for PV power plants by a concise step-by-step curriculum. We will go from PV basics like solar resource assessment via principal PV technologies to the qualification of PV modules in the lab including the detection of potential failures and damage modes of modules. The next topics are basic plant setups and the stages of a PV project: Development, Engineering, Procurement, Construction, Operation and de-Commissioning.

Energy yield prediction will be discussed as well as system inspection, system testing and quality monitoring. It will be looked at the economics of the PV systems, including calculating different economic evaluation methods like payback and levelized cost of electricity. Economic feasibility and an overview of well-known and currently discussed potentially future business models for PV plants/systems will be discussed.

Who should enroll

The target group are engineers and technicians as well as employees in the areas of management, portfolio management, trading, procurement, sales management, power plant resources planning, grid operation or PV plant manager and technicians. A fundamental mathematical and economic understanding is required.

Key benefits

- Overview of the PV-technologies and international standards and norms for PV-plants
- Knowledge of latest results of Fraunhofer research and methods of PV-plant designs and economic efficiency calculation
- Provision of learning materials and exercise in the topics of PV-plant quality assurance and techno-economic analysis for PV-plants as well as interesting examples from practice and research
- Exchange of experience between participants and Fraunhofer experts

Further Information

Format

Certified Training Course
E-Learning
Language: English

Starting date

See Website

Duration

5 days over 5 weeks

Course fee

Contact for further information

Qualification

Fraunhofer Training Certificate

Application

<http://s.fhg.de/NLt>





Certificate of Advanced Studies

Modular Training Courses

UNDERSTANDING SOLAR THERMAL ENERGY CONVERSION

GRID INTEGRATION OF RENEWABLE ENERGIES

Further Information

Format

Certified Training Course
E-Learning
Language: English

Starting date

See Website

Course fee and duration

€ 1650 for Certificate of Attendance (6 months)
€ 2970 for Certificate of Advanced Studies (7 months, 10 credit points)

Qualification

CAS from the Fraunhofer Institute for Solar Energy Systems ISE in scientific cooperation with the University of Freiburg

Application

<http://s.fhg.de/NLt>

Program overview

Understanding Solar Thermal Energy Conversion (USTEC) is an online training course explaining how to use solar energy for heating. The course is hands-on training for the real life scenario taking the decision about buying a solar thermal energy conversion technology. The course therefore starts with a comparison of conventional heating technologies (like gas, oil and coal) and renewable solutions for heating (heat pumps, photovoltaics, biomass, geothermal energy). Subsequently the focus is on Solar Thermal Energy Conversion. Here we provide deep insights in the working principle, the components and materials used, the process of production and the design challenges of solar thermal systems. We go through complete systems component by component understanding the functions and the specifics for different applications, like domestic hot water, heating, cooling or swimming pool heating.

Insights are given to the technical characteristics of those components, so that we can answer questions, like: What is the efficiency of those systems? How to calculate the costs? What is the "best" solar thermal collector? How to compare? Within the 9 units well-structured in 27 lessons, you will find comprehensive information provided in an easy way, making it comfortable to study at home after work. Surplus interactive consulting hours are provided by regular web-meetings.

Who should enroll

USTEC is designed for curious professionals from the heating and plumbing sector. Everyone is welcome, basic knowledge in technics is favorably.

Key benefits

- Qualifying with Certificate of Attendance and official CAS certificate (optional).
- Easy accessible, state-of-the-art knowledge in Solar Thermal Energy Conversion
- Context embedded, real life scenario based learning structure
- Motivating and modern didactics
- Networking with professional peers around the globe
- Being part of the global expert community transforming energy systems

Program overview

On base of training material from leading experts world-wide, we offer in-house training courses covering the entire field of Renewable Energies, from basics about wind and solar energy utilization to grid codes, from wind and solar power forecasts to grid studies. In cooperation with our partners Overspeed, Energynautics, and Oldenburg University, we developed state-of-the-art training material and a team of lecturers who have profound academic and industrial training experience in almost all countries around the globe. Make your selection from our list of training content, and we will provide you an effective in-house training course with excellent trainers.

The following modules are already available. There are more to come, so please ask.

- Introduction to Renewable Energy (RE) Utilization
- Predictions of wind and solar power
- Balancing and scheduling in RE-rich systems
- Market, policy and regulatory mechanisms
- Grid codes and technical standards
- Grid and system integration studies
- Control of RE power plants
- Visualization and analysis of RE generation

Who should enroll

Employees of regulatory authorities and supraregional distribution system operators

Key benefits

- The content of the in-house training course is designed specifically for your needs.
- All our course modules consist of face-to-face class room training. In addition all participants receive a script which is made available upfront to be able to prepare the face-to-face class room training beforehand so that the on-site time can be used the most effective way.

Further Information

Format

Modular in-house Training Courses, Language: English

Starting date

On request

Duration

3–5 days

Course fee

Depending on the booked modules. For further information see website

Qualification

Training certificate

Application

www.iee.fraunhofer.de/knowhow

ÚNASE A LA RED INTERNACIONAL DE FRAUNHOFER

International collaborations of the Fraunhofer-Gesellschaft with excellent research partners and innovative companies around the world ensure direct access to regions of the greatest importance to present and future scientific progress and economic development.



Facts about Fraunhofer Academy

13 YEARS

of qualified training programs

> 4200

participants are part of our training programs annually

> 280

courses of continuing education programs are conducted each year

Contact



Lena Kurtz
Program Management



Clara Tu
*International Education
Management*

If you have any queries or require further information about any of our programs, do not hesitate to contact the Fraunhofer Academy team.

Contact us

- by e-mail: academy@fraunhofer.de
- by visiting our website:

www.academy.fraunhofer.de/en

Or follow us on

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