



From the Basics to Design Photovoltaic Learning Program

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✓ REQUIREMENTS

No previous knowledge to join the course successfully.

🗨️ TARGET GROUP

Entrepreneurs and their teams, installers, architects, planners, decision makers, sales specialists, government, education, end customers and you if you want to get your business growing fast! You if you want to avoid costly mistakes.

👤 INSTRUCTOR

CEO / Dipl.-Ing. Environment Techniques
Authorized Expert for Photovoltaic Equipment (TÜV)
Alexander Kaub

📅 DATE & TIME

November 20th till 22th 2017

Monday to Wednesday

9:00 – 16:45 pm

📍 Location

Makati/ Manila, the Philippines
Infinity Tower Conference Room
H.V. De La Costa St. cor. L.P. Leviste St.
Salcedo Village, Makati City

💰 COURSE INVESTMENT

22.699 PHP per participant incl. certificate and examination fee



Quality of the curricula

The training is designed to empower the participants to work in the Solar Energy Sector. It's **necessary to take the right decisions** and be able to plan, design, buy, install and operate infinite, clean and sustainable solar energy systems.

It comprehends **all the important basic knowledge with many practical examples and calculations from the practice.**

The curricula contains the latest state of the art knowledge, gained and provided in Germany, the No. 1 country in photovoltaics during the last two decades.

inotec solarcenter international gmbh

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The Academy 
of Solar Power Education

1. PV Basics

- 1 why solar energy, argumentations
- Facts, pros and cons about PV

2. Components of PV-Systems in a glance, overview about:

- Modules & inverters, devices in energy storage systems (OffGrid)
- Mounting system, types and costs, DC-cabling and connectors
- Grounding & lightning protection, monitoring systems, AC-material

3. Sunlight becomes electricity

- Design and calculation fundamentals
- Performance and yield, global radiation, the technical units
- Diffuse and direct radiation, radiation maps and data
- Daily insolation, peak sun hours, azimuth and tilt angle
- Group tasks: knowledge transfer into the practice
- Direct und diffuse sunlight, yield, the photovoltaic effect
- Knowledge transfer: use the data in several practical reports
- Tasks: find climate data for you project site

4. Electrical basics to understand the correlations

- Electrical basics, current, voltage, electric power, yield, temperature dependence, series/parallel circuits for modules
- Standard test conditions (STC), efficiency versus price
- Practical exercises (individual and in small groups)

5. Solar modules and their properties

- Module technology types, characteristic values, and production
- Common modules defects and how to avoid them
- Guaranty, quality, testing criteria, module comparison, module comparison, module selection
- Aging mechanism, exercises in order to transfer into practice

6. Inverter and their properties

- Inverter types, inverter concepts
- PV grid tied inverter, bidirectional inverters, island inverter
- MPP-Tracking, unbalanced load, installation sites
- Aging mechanism, live span, service and maintenance
- Min. and max. modules in a string, parallel connection of strings
- Knowledge transfer into practice: design the strings of inverter

7. Shading

- Types of shadows and their effects
- Technical background, practical examples and impacts
- Methods to identify shadows and to calculate the yield losses
- Two ways to analyze and calculate shadow with PV-Sol Premium
- 4 solutions to minimize the effects of shadows
- Exercise: minimize the effect of shadows

8. Grid connection and energy storage

- Overview On- and Off-Grid Systems
- Grid parallel-, net metering-, energy storage solutions
- Backup system & fuel saver, most cost effective systems solutions
- Exercise: design a nat metering system using PV Sol Premium

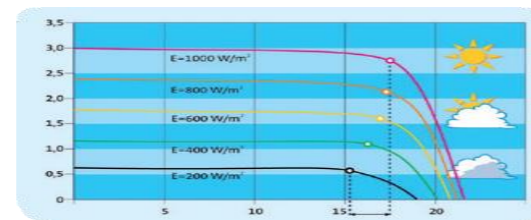
9. Profitability analysis of PV plants for your customer

- Yield forecast, cost of a PV-plant, calculating Return Of Investment
- Loans and equity, own consumption /feed in
- Energy production costs/calculation leveled cost of electricity
- Cash account/compare of investments /detailed analysis and diagrams, arguments to convince your customer
- Exercise to transfer your knowledge into practice

Designing PV Arrays

10. Site selection and site survey

- What data are required
- Data assembly
- Tools and documentation



11. Consulting with the customer

- Satisfy your customer by answer all his questions right

12. Design a PV-array

- Design roles summary
- Determine the number of solar modules fitting on the available space by considering i.e. row distance, security distances
- Create the bill of material, quotation and Pay Back Period
- Design the system with the software PV-Sol Premium 2D planning, obtain climate data, configure the system using roof parameters

The participants will receive a trail version of PV Sol Premium 2016 for this training.

13. Design insights of inverters

- Design roles, max. system voltage and current, mpp range
- nominal power ratio
- Performance ratio
- Influence of orientation and shading

14. Discover inverter design by using the free software sunny design

- How to choose the best inverter design
- Compare the different inverter designs regarding their yield production and the specific inverter prices
- Choosing inverters

Don't forget your Laptop Computer Charger. You will receive and use some PV Software during the course.



Stand-alone Systems, the principles of Off Grid PV systems

15. Off Grid essentials:

- Energy production
- Energy storage
- Storage management
- Load management

16. The planning and design of off-grid systems based on selected examples

- Load analysis
- System efficiency
- PV-Generator design
- DC connected isolated photovoltaic systems
- AC connected isolated photovoltaic systems
- Battery design

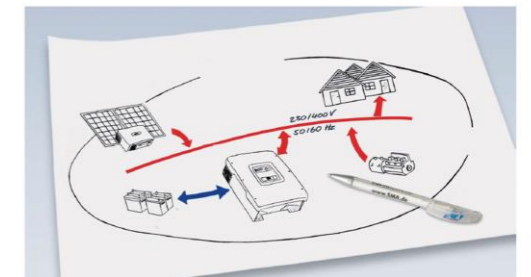
17. Practical exercises with individual and group tasks

- Design tasks

DESIGN



- Rough estimation of the main components of the off-grid system requires few steps and essential information



Expert Course Faculty Leader
Alexander Kaub

CEO/Dipl.-Ing. Environment Techniques Authorized Expert for Photovoltaic Equipment (TÜV)

Alexander Kaub, founder and lecturer of The Academy and inutec is working successfully for the last 20 years in the field of solar photovoltaic (PV) energy. With his company inutec solarcenter he is a true pioneer who has taken part in all aspects of the solar market. In 2013 he attended 12 seminars about the latest PV knowledge in Germany to be up to date. He is an Authorized Expert for Photovoltaic Equipment (TÜV)