

# Postgraduate Certificate

## Direct Current Photovoltaic Installations





## Postgraduate Certificate Direct Current Photovoltaic Installations

- » Modality: online
- » Duration: 6 weeks
- » Certificate: TECH Global University
- » Accreditation: 6 ECTS
- » Schedule: at your own pace
- » Exams: online

Website: [www.techtute.com/us/engineering/postgraduate-certificate/direct-current-photovoltaic-installations](http://www.techtute.com/us/engineering/postgraduate-certificate/direct-current-photovoltaic-installations)

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# 01

# Introduction

Recent technological advances have positioned Direct Current Photovoltaic Installations as an increasingly viable and competitive option in the global energy scenario. These systems have multiple advantages, among which stands out their ability to implement modular and scalable configurations depending on the energy demand. Given this scenario, engineering professionals need to keep abreast of emerging trends in the integration of energy storage and the digitalization of system management. Only then will experts be able to optimize these installations and offer highly innovative solutions. In this context, TECH presents a revolutionary university program focused on Direct Current Photovoltaic Installations. Moreover, it is delivered in a convenient online format.







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*With this 100% online Postgraduate Certificate, you will manage the most innovative strategies to optimize the performance and energy efficiency of the systems”*

DC solar PV has revolutionized the global energy landscape, driven by the significant decrease in technology costs and the growing demand for renewable energy sources. In this regard, experts forecast that the installed capacity of this electricity will continue to expand at a compound annual rate of 14%, exceeding 1.5 terawatts in the coming years. This underscores the increasingly crucial role of solar energy in the transition to a low-carbon economy. In the face of this, engineers must offer sustainable and cost-effective energy solutions to stand out in the market.

Against this backdrop, TECH has created a pioneering Postgraduate Certificate in Direct Current Photovoltaic Installations. Designed by specialists in this field, the academic itinerary will delve into the components that are part of photovoltaic systems (including optimizers, regulators or electrical protections). Along the same lines, the syllabus will analyze battery selection criteria, which will enable graduates to minimize energy losses during charge and discharge cycles. In addition, the program will provide students with the most advanced techniques in DC electrical protection. In this way, professionals will prevent electrical events that could cause serious damage or jeopardize the integrity of the systems.

On the other hand, in order to consolidate the mastery of the syllabus, this university program applies the revolutionary Relearning teaching system, of which TECH is a pioneer. It promotes the assimilation of complex concepts through their natural and progressive reiteration. Likewise, the program is nourished by materials in different formats, such as infographics or explanatory videos. All this in a convenient 100% online modality, which allows each person to adjust their schedule to their responsibilities. All graduates need is an electronic device with an Internet connection to access the Virtual Campus.

This **Postgraduate Certificate in Direct Current Photovoltaic Installations** contains the most complete and up-to-date program on the market. The most important features include:

- ♦ The development of case studies presented by experts in Photovoltaic Energy
- ♦ The graphic, schematic, and practical contents with which they are created, provide practical information on the disciplines that are essential for professional practice
- ♦ Practical exercises where the self-assessment process can be carried out to improve learning
- ♦ Its special emphasis on innovative methodologies
- ♦ Theoretical lessons, questions to the expert, debate forums on controversial topics, and individual reflection assignments
- ♦ Content that is accessible from any fixed or portable device with an Internet connection



*Efficiently update your knowledge in Direct Current Photovoltaic Installations to get a distinctive quality boost in your career as an Engineer"*



*Are you looking to incorporate in your practice the most sophisticated strategies for preventive maintenance of Photovoltaic Installations? Achieve it with this program in only 180 hours"*

The program's teaching staff includes professionals from the field who contribute their work experience to this educational program, as well as renowned specialists from leading societies and prestigious universities.

The multimedia content, developed with the latest educational technology, will provide the professional with situated and contextual learning, i.e., a simulated environment that will provide immersive education programmed to prepare for real situations.

This program is designed around Problem-Based Learning, whereby the professional must try to solve the different professional practice situations that arise during the course. For this purpose, the students will be assisted by an innovative interactive video system created by renowned and experienced experts.

*You will delve into the Technical Parameters of Batteries to optimize the overall performance of the photovoltaic system.*

*TECH's Relearning system will allow you to learn at your own pace without depending on external teaching conditions.*





# 02

# Objectives

Thanks to this Postgraduate Certificate, engineers will have a holistic understanding of the physical and technological principles behind DC solar photovoltaic power generation. In the same line, professionals will develop advanced skills to size photovoltaic systems according to specific energy needs and environmental conditions. In this way, experts will take into account aspects ranging from solar irradiation or panel orientation to energy losses. In addition, they will be able to optimize the performance of photovoltaic systems through proper component selection and system monitoring.







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*You will master the most efficient techniques for DC photovoltaic system installations and ensure optimal operation throughout the life of the system”*



## General Objectives

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- ♦ Develop a specialized vision of the photovoltaic market and its lines of innovation
- ♦ Analyze the typology, components and advantages and disadvantages of all configurations and schemes of large photovoltaic plants
- ♦ Specify the typology, components and the advantages and disadvantages of all the configurations and schemes of self-consumption photovoltaic installations
- ♦ Examine the typology, components and advantages and disadvantages of all off-grid PV plant configurations and schemes
- ♦ Establish the typology, components and the advantages and disadvantages of the hybridization of photovoltaic technology with other conventional and renewable generation technologies
- ♦ Establish the fundamentals of the operation of the components of the direct current part of the photovoltaic installations
- ♦ Understand all the properties of the components
- ♦ Establish the fundamentals of the operation of the components of the direct current part of the photovoltaic installations
- ♦ Understand all the properties of the components
- ♦ Characterize the solar resource on any site in the world
- ♦ Handle terrestrial and satellite databases
- ♦ Select optimal sites for photovoltaic systems
- ♦ Identify other factors and their influence on the photovoltaic installation
- ♦ Assess the profitability of investments, operation and maintenance activities and financing of photovoltaic projects
- ♦ Identify risks that may affect the viability of investments
- ♦ Manage PV projects
- ♦ Design and dimensioning of photovoltaic plants, including site selection, sizing of components and their coupling
- ♦ Estimate energy yields
- ♦ Monitor photovoltaic plants
- ♦ Manage health and safety
- ♦ Design and dimensioning of self-consumption photovoltaic installations, including site selection, sizing of components and their coupling
- ♦ Estimate energy yields
- ♦ Monitor photovoltaic installations
- ♦ Design and dimensioning of off-grid photovoltaic systems, including site selection, sizing of components and their coupling
- ♦ Estimate energy yields
- ♦ Monitor photovoltaic installations
- ♦ Analyze the potential of PVGIS, PVSYST and SAM software in the design and simulation of photovoltaic installations
- ♦ Simulate, dimension and design photovoltaic installations using the following softwares: PVGIS, PVSYST and SAM.
- ♦ Acquire skills in the assembly and commissioning of installations
- ♦ Develop specialized knowledge in the operation and preventive and corrective maintenance of the facilities



## Specific Objectives

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- ♦ Be qualified to select the optimum equipment for each installation
- ♦ Properly couple components to each other and according to climatic and site conditions



*You will have access to the best multimedia resources to put what you have studied into practice in a simpler way"*



# 03

# Course Management

TECH's philosophy is to offer the most complete programs on the educational market. For this reason, TECH carefully selects each of its teaching staff. This Postgraduate Certificate has the participation of recognized experts in Direct Current Photovoltaic Installations. These professionals have an extensive working career, where they have worked in leading international institutions. These specialists have created a myriad of teaching contents defined by their excellent quality and in line with the needs of today's labor market. In this way, engineers will enjoy an experience that will expand their professional perspectives.



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*An experienced teaching team, made up of specialists in Photovoltaic Energy, will guide you throughout the learning process and resolve any doubts you may have"*

## Management



### Dr. Blasco Chicano, Rodrigo

- ♦ Academic in Renewable Energy, Madrid
- ♦ Energy Consultant at JCM Bluenergy, Madrid
- ♦ PhD in Electronics from the University of Alcalá
- ♦ Specialist in Renewable Energy from the Complutense University of Madrid
- ♦ Master's Degree in Energy, Complutense University of Madrid
- ♦ Degree in Physics from the Complutense University of Madrid

## Professors

### Mr. Alegre Peñalva, Alejandro

- ♦ Researcher in Materials Physics
- ♦ Research Trainee at the Institute of Structure of Matter, CSIC
- ♦ Degree in Physics, Mention in Physics of Materials, European University of Madrid
- ♦ Introductory Course in Structure of Matter Research: From Elementary Particles to High Molecular Weight Systems, IEM-CSIC



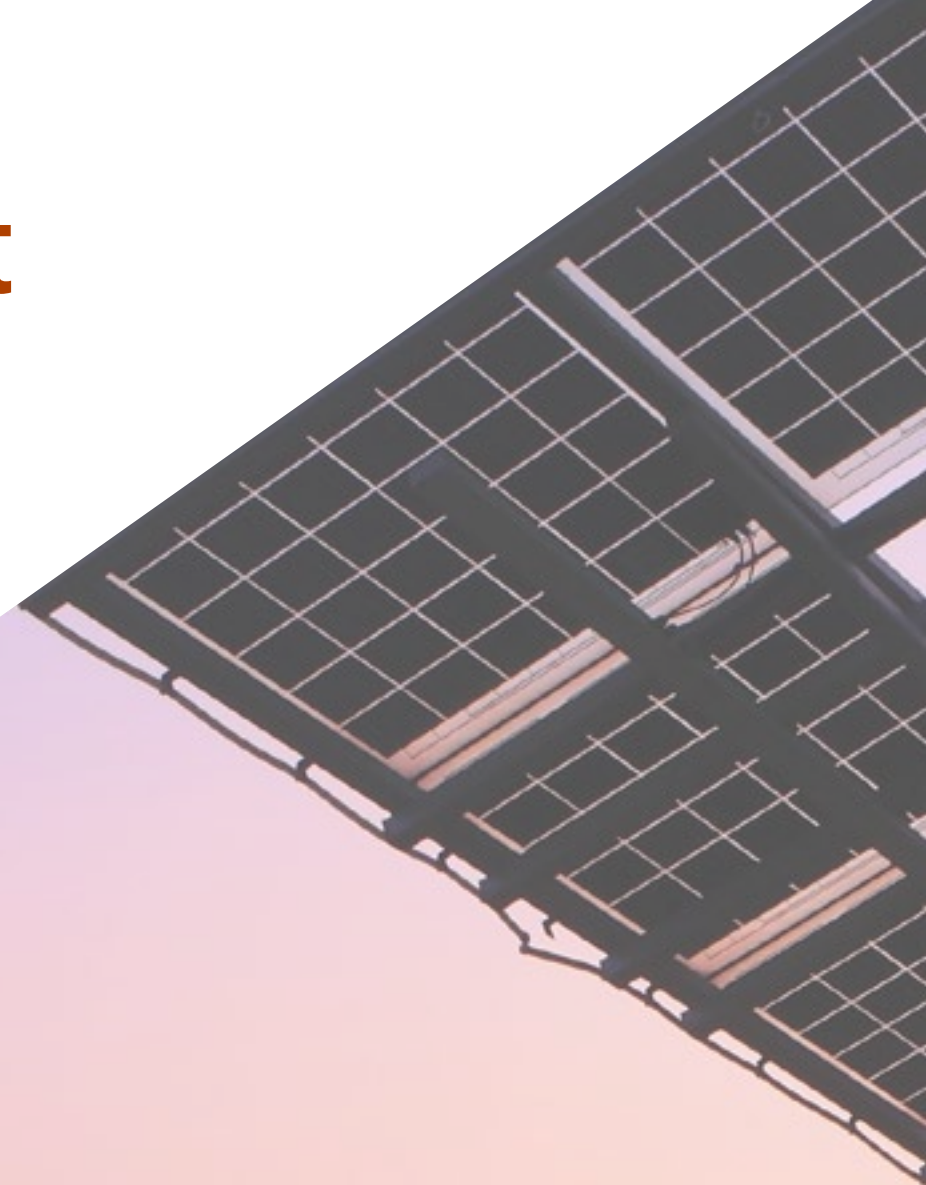


# 04

# Structure and Content

With this university program, engineers will master the physical and technological principles of electricity generation through direct current photovoltaic systems. The syllabus will focus on the analysis of the components that are part of the Photovoltaic Installations. In this sense, the syllabus will delve into how power optimizers and regulators serve to maximize energy production at the level of each photovoltaic module.

During the program, students will develop skills to size photovoltaic systems according to environmental conditions, taking into account factors such as solar irradiation or the inclination of the panels.







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*You will be able to size direct current photovoltaic systems for a wide variety of applications and energy needs”*



## Module 1. Direct Current Photovoltaic Installations

- 1.1. Solar Cell Technologies
  - 1.1.1. Solar Technologies
  - 1.1.2. Evolution by Technology
  - 1.1.3. Comparative Analysis of the main Commercial Technologies
- 1.2. Photovoltaic Modules
  - 1.2.1. Electrical Technical Parameters
  - 1.2.2. Other Technical Parameters
  - 1.2.3. Technical Regulatory Framework
- 1.3. Photovoltaic Module Selection Criteria
  - 1.3.1. Technical Criteria
  - 1.3.2. Economic Criteria
  - 1.3.3. Other Criteria
- 1.4. Optimizers and Regulators
  - 1.4.1. Optimizers
  - 1.4.2. Regulators
  - 1.4.3. Advantages and Disadvantages
- 1.5. Battery Technologies
  - 1.5.1. Types of Cells
  - 1.5.2. Evolution by Technology
  - 1.5.3. Comparative Analysis of the main Commercial Technologies
- 1.6. Technical Parameters of Batteries
  - 1.6.1. Technical Parameters of Lead-Acid Batteries
  - 1.6.2. Technical Parameters of Lithium Batteries
  - 1.6.3. Durability, Degradation and Efficiency
- 1.7. Batteries Selection Criteria
  - 1.7.1. Technical Criteria
  - 1.7.2. Economic Criteria
  - 1.7.3. Other Criteria





- 1.8. Direct Current Electrical Protections
  - 1.8.1. Protection Against Direct and Indirect Contacts
  - 1.8.2. Protection Against Overvoltage
  - 1.8.3. Other Protections
    - 1.8.3.1. Grounding, Insulation, Overload and Short-Circuit Systems
- 1.9. Direct Current Wiring
  - 1.9.1. Type of Wiring
  - 1.9.2. Wiring Selection Criteria
  - 1.9.3. Dimensioning of Wiring, Conduits, Cable Ducts, Cable Boxes
- 1.10. Fixed and Solar Tracking Structures
  - 1.10.1. Types of Structures with Solar Tracking. Materials
  - 1.10.2. Types of Structures with Solar Tracking. One or Two Axes
  - 1.10.3. Advantages and Disadvantages of the Type of Solar Tracking

“A university program designed to give a boost to your professional career as an engineer. Enroll now!”



05

# Methodology

This academic program offers students a different way of learning. Our methodology uses a cyclical learning approach: **Relearning**.

This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.







*Discover Relearning, a system that abandons conventional linear learning, to take you through cyclical teaching systems: a way of learning that has proven to be extremely effective, especially in subjects that require memorization"*

## Case Study to contextualize all content

Our program offers a revolutionary approach to developing skills and knowledge. Our goal is to strengthen skills in a changing, competitive, and highly demanding environment.

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*At TECH, you will experience a learning methodology that is shaking the foundations of traditional universities around the world”*



*You will have access to a learning system based on repetition, with natural and progressive teaching throughout the entire syllabus.*



*The student will learn to solve complex situations in real business environments through collaborative activities and real cases.*

### A learning method that is different and innovative

This TECH program is an intensive educational program, created from scratch, which presents the most demanding challenges and decisions in this field, both nationally and internationally. This methodology promotes personal and professional growth, representing a significant step towards success. The case method, a technique that lays the foundation for this content, ensures that the most current economic, social and professional reality is taken into account.

“*Our program prepares you to face new challenges in uncertain environments and achieve success in your career”*

The case method is the most widely used learning system in the best faculties in the world. The case method was developed in 1912 so that law students would not only learn the law based on theoretical content. It consisted of presenting students with real-life, complex situations for them to make informed decisions and value judgments on how to resolve them. In 1924, Harvard adopted it as a standard teaching method.

What should a professional do in a given situation? This is the question that you are presented with in the case method, an action-oriented learning method. Throughout the program, the studies will be presented with multiple real cases. They will have to combine all their knowledge and research, and argue and defend their ideas and decisions.



## Relearning Methodology

TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

We enhance the Case Study with the best 100% online teaching method: Relearning.

*In 2019, we obtained the best learning results of all online universities in the world.*

At TECH, you will learn using a cutting-edge methodology designed to train the executives of the future. This method, at the forefront of international teaching, is called Relearning.

Our university is the only one in the world authorized to employ this successful method. In 2019, we managed to improve our students' overall satisfaction levels (teaching quality, quality of materials, course structure, objectives...) based on the best online university indicators.



In our program, learning is not a linear process, but rather a spiral (learn, unlearn, forget, and re-learn). Therefore, we combine each of these elements concentrically.

This methodology has trained more than 650,000 university graduates with unprecedented success in fields as diverse as biochemistry, genetics, surgery, international law, management skills, sports science, philosophy, law, engineering, journalism, history, and financial markets and instruments. All this in a highly demanding environment, where the students have a strong socio-economic profile and an average age of 43.5 years.

*Relearning will allow you to learn with less effort and better performance, involving you more in your training, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation for success.*

From the latest scientific evidence in the field of neuroscience, not only do we know how to organize information, ideas, images and memories, but we know that the place and context where we have learned something is fundamental for us to be able to remember it and store it in the hippocampus, to retain it in our long-term memory.

In this way, and in what is called neurocognitive context-dependent e-learning, the different elements in our program are connected to the context where the individual carries out their professional activity.



This program offers the best educational material, prepared with professionals in mind:



### Study Material

All teaching material is produced by the specialists who teach the course, specifically for the course, so that the teaching content is highly specific and precise.

These contents are then applied to the audiovisual format, to create the TECH online working method. All this, with the latest techniques that offer high quality pieces in each and every one of the materials that are made available to the student.



### Classes

There is scientific evidence suggesting that observing third-party experts can be useful.

Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.



### Practising Skills and Abilities

They will carry out activities to develop specific skills and abilities in each subject area. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop in the context of the globalization that we are experiencing.



### Additional Reading

Recent articles, consensus documents and international guidelines, among others. In TECH's virtual library, students will have access to everything they need to complete their course.







#### Case Studies

Students will complete a selection of the best case studies chosen specifically for this program. Cases that are presented, analyzed, and supervised by the best specialists in the world.



#### Interactive Summaries

The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

This exclusive educational system for presenting multimedia content was awarded by Microsoft as a "European Success Story".



#### Testing & Retesting

We periodically evaluate and re-evaluate students' knowledge throughout the program, through assessment and self-assessment activities and exercises, so that they can see how they are achieving their goals.



06

# Certificate

The Postgraduate Certificate in Direct Current Photovoltaic Installations guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Global University.





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*Successfully complete this program  
and receive your university qualification  
without having to travel or fill out  
laborious paperwork”*



This private qualification will allow you to obtain a **Postgraduate Certificate in Direct Current Photovoltaic Installations** endorsed by **TECH Global University**, the world's largest online university.

**TECH Global University** is an official European University publicly recognized by the Government of Andorra ([official bulletin](#)). Andorra is part of the European Higher Education Area (EHEA) since 2003. The EHEA is an initiative promoted by the European Union that aims to organize the international training framework and harmonize the higher education systems of the member countries of this space.

The project promotes common values, the implementation of collaborative tools and strengthening its quality assurance mechanisms to enhance collaboration and mobility among students, researchers and academics.

This **TECH Global University** private qualification, is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Postgraduate Certificate in Direct Current Photovoltaic Installations**

Modality: **online**

Duration: **6 weeks**

Accreditation: **6 ECTS**





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