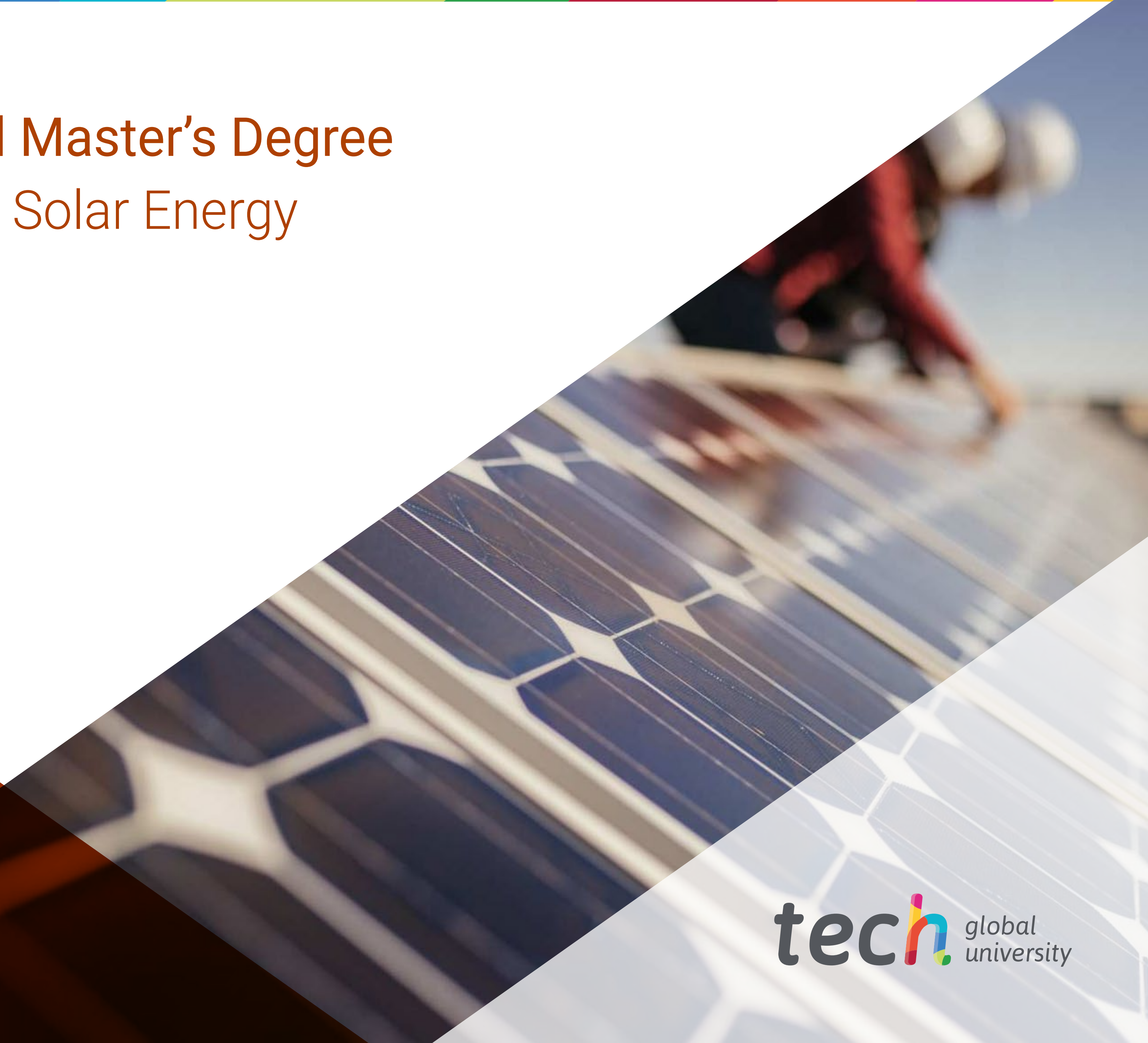
Professional Master's Degree
Photovoltaic Solar Energy



tech global university

Professional Master's Degree
Photovoltaic Solar Energy

» Modality: **online**
» Duration: **12 months**
» Certificate: **TECH Global University**
» Accreditation: **60 ECTS**
» Schedule: **at your own pace**
» Exams: **online**

Website: **www.techtitute.com/us/engineering/professional-master-degree/photovoltaic-solar-energy**

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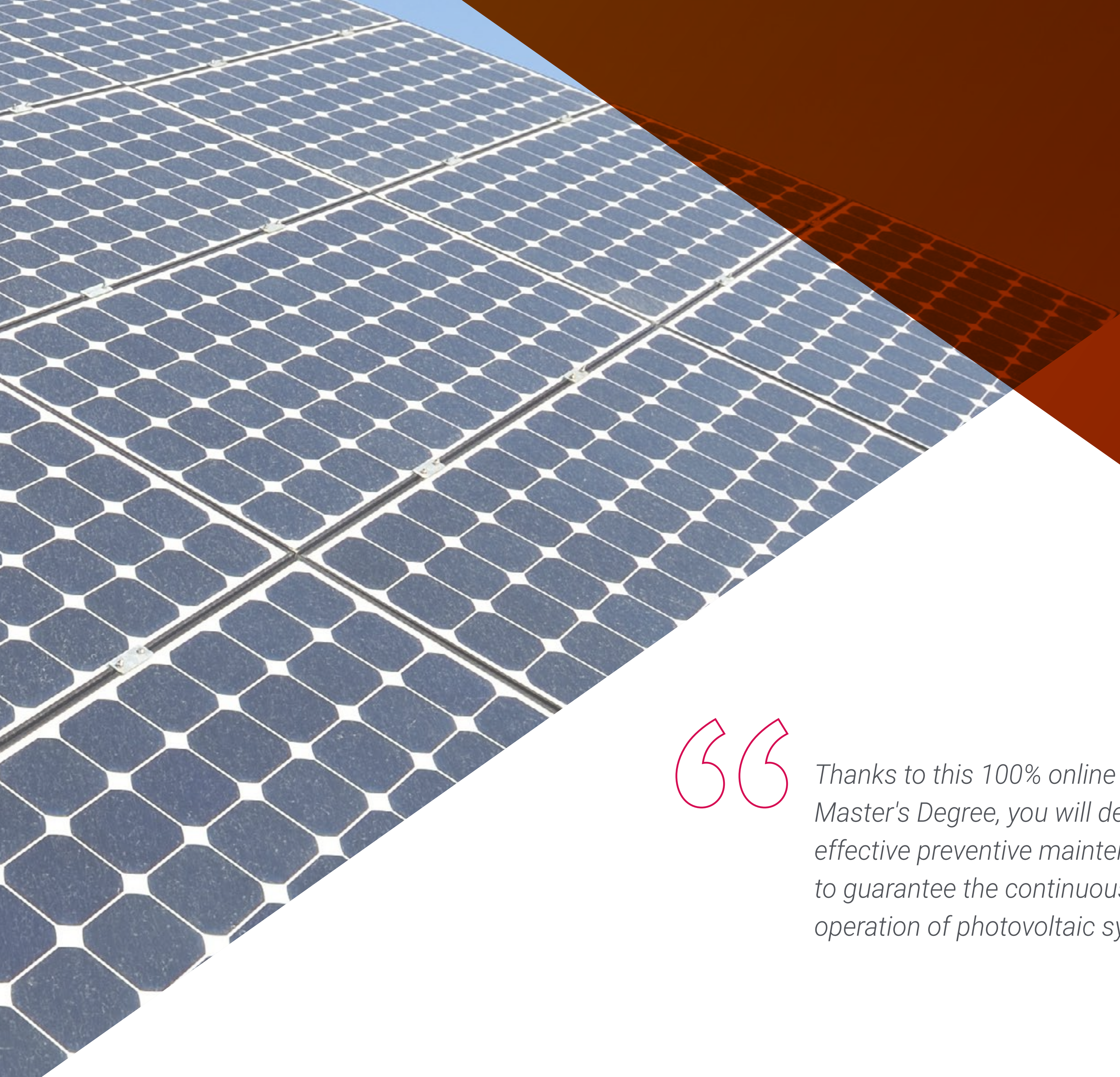
01
Introduction

Photovoltaic solar energy has established itself as a key solution to address the energy and environmental crisis. With a compound annual growth rate of 25% in the last decade, this type of electricity has not only significantly reduced its costs, but also improved its efficiency. In view of this, more and more companies are demanding the incorporation of highly specialized engineers in this field to make the transition to a more sustainable energy system that is less dependent on fossil fuels. To take advantage of these opportunities, experts need to acquire a competitive advantage that differentiates them from other candidates. That is why TECH presents a revolutionary online program focused on the most innovative strategies to carry out photovoltaic projects.



Thanks to this 100% online Professional Master's Degree, you will develop the most effective preventive maintenance plans to guarantee the continuous and efficient operation of photovoltaic systems"

Photovoltaics has become an essential solution for decarbonizing the energy sector and mitigating climate change. Advances in solar cell efficiency, cost reduction and increasing energy storage capacity are driving unprecedented adoption of PV technology. In this context, engineering professionals must keep abreast of the current state of the art in the PV field. Only in this way will they be able to overcome the challenges of grid integration and incorporate the most cutting-edge strategies for its implementation into their practice.

In this scenario, TECH launches a pioneering and very complete Professional Master's Degree in Photovoltaic Solar Energy. Designed by experts in this field, the academic itinerary will cover issues ranging from the location of photovoltaic installations or administrative aspects to the maintenance of photovoltaic plants. During the course of the program, graduates will acquire advanced skills to effectively handle the most sophisticated design, simulation and sizing software. At the same time, the syllabus will analyze the most innovative strategies to optimize sizing.

In order to consolidate the mastery of all these contents, the university program applies the innovative Relearning system. TECH is a pioneer in the use of this teaching model, which promotes the assimilation of complex concepts through their natural and progressive reiteration. Also, the academic itinerary is nourished by materials in various formats such as explanatory videos and infographics. All this in a convenient 100% online modality that allows students to adjust their schedules according to their responsibilities and availability. In this sense, the only thing experts will need is an electronic device with an Internet connection to access the Virtual Campus. In this way, they will be able to enjoy the most complete and up-to-date teaching materials on the educational market.

This **Professional Master's Degree in Photovoltaic Solar Energy** ccontains 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 Solar 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

The Virtual Campus will be available to you 24 hours a day, so that you can access it at the time that suits you best"

You will delve into the Calculation of Radiation on Tilted Surfaces, which will allow you to maximize the harvesting of solar energy"

Looking to incorporate into your practice the most sophisticated strategies to maximize the performance of photovoltaic systems? Achieve it with this program in just 12 months.

Thanks to the Relearning method, you will be able to consolidate the key concepts offered by this university course.

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.

02

Objectives

Through this Professional Master's Degree, engineers will have a solid understanding of the different photovoltaic technologies and the principles of solar energy. Likewise, graduates will master the most advanced simulation tools for the accurate sizing of photovoltaic systems and the assessment of their performance. In tune with this, professionals will be highly qualified in the maintenance of photovoltaic systems, thereby ensuring optimal operation and significantly prolonging their useful life.

You will be able to plan, manage and supervise photovoltaic projects from the design stage all the way through to implementation"

General Objectives

- 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 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

Module 1. Photovoltaic Installations

- Identify the present and future possibilities of photovoltaic technology
- Differentiate the wide range of possible configurations and schemes, identifying in each case their advantages and disadvantages
- Analyze the role of each component within a photovoltaic installation
- Determine the synergies of hybridization of photovoltaic technology with other conventional and renewable generation technologies

Module 2. Direct Current Photovoltaic Installations

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

Module 3. Alternating Current Photovoltaic Installations

- Identify possible limitations or barriers to a photovoltaic installation due to its location
- Analyze the effect of other factors on electricity production such as shading, dirt, altitude, lightning, theft, etc.

Module 4. Location of Photovoltaic Installations

- Identify possible limitations or barriers to a photovoltaic installation due to its location
- Analyze the effect of other factors on electricity production such as shading, dirt, altitude, lightning, theft, etc.

Module 5. Economic, Administrative and Environmental Aspects of Photovoltaic Plants

- Analyze, from an economic point of view, the economic viability in any phase of the project: investments, operation and maintenance and financing
- Be competent for the processing of any photovoltaic project before the different authorities, both in time and form, as well as its follow-up

Module 6. Large Photovoltaic Plant Design

- Select site locations for photovoltaic plants, either for your own plant or for third parties
- Control the monitoring of the PV installation

Module 7. Self-Consumption Photovoltaic Installation Design

- Selection of the optimal installation components
- Control the monitoring of the PV installation

Module 8. Off-Grid Photovoltaic Installation Design

- Selection of the optimal installation components
- Component Sizing
- Control the monitoring of the PV installation
- Ensure that electricity demand is met in quantity and quality

Module 9. Design, Simulation and Sizing Software

- Dimensionar los componentes de las instalaciones
- Optimize and estimate productions
- Acquire knowledge of how to couple the components
- Analyze external influences such as shading, soiling, on production

Module 10. Assembly, Operation and Maintenance of Photovoltaic Plants

- Plan the assembly, operation and maintenance, both technically and in terms of Health and Safety
- Manage incidents during the useful life of the installation
- Perform technical reports of operation and maintenance: Productions, Alarms, Ratios
- Establish maintenance tasks

Enjoy a pleasant and effective learning experience through the teaching formats offered by this program, such as the explanatory video or the interactive summary"

03

Skills

After completing this university program, engineers will be highly qualified to design photovoltaic systems for residential, commercial and industrial applications according to their energy needs. In the same line, professionals will handle the most advanced software to simulate and model the performance of photovoltaic systems. In this way, experts will optimize both their design and sizing. At the same time, graduates will implement quality control and risk assessment systems in photovoltaic projects.

You will efficiently manage the integration of photovoltaic systems with the electrical grid"

General Skills

- Design photovoltaic systems, from small residential installations to large solar plants
- Manage simulation tools for accurate sizing of PV systems and evaluation of their performance
- Diagnose failures in photovoltaic systems to ensure their optimal performance
- Plan, manage and supervise PV projects from the design phase through to implementation

You will be able to perform financial analysis to analyze the feasibility of PV projects, including seeking financing and managing budgets"

Specific Skills

- Design photovoltaic systems for residential, commercial and industrial applications, considering energy needs
- Use specialized software to model the performance of photovoltaic systems, optimizing their design and sizing
- Perform shading analysis and assess its impact on the performance of photovoltaic systems
- Assess costs and perform financial feasibility analysis of PV projects
- Implement risk quality control systems
- Manage the obtention of permits and licenses required for the installation of photovoltaic systems

04

Course Management

TECH's philosophy is to offer the most comprehensive and up-to-date programs on the educational market, which is why it carries out a rigorous process to assemble its teaching staff. For this Professional Master's Degree, TECH brings together the best specialists in the field of Photovoltaic Solar Energy. These experts have an extensive professional background, which has led them to be part of internationally recognized entities. In this way, they have created teaching materials characterized by their quality and by adjusting to the requirements of the current labor market. Therefore, engineers will have access to an immersive experience that will broaden their professional horizons.

The professors of this university program will offer you the most sophisticated techniques to avoid losses due to fouling"

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 from the Complutense University of Madrid
- Degree in Physics from the Complutense University of Madrid

Professors

Ms. Katz Perales, Raquel

- Environmental Science and Renewable Energy Specialist at Asociación Por Ti Mujer
- Green Infrastructure Project Development at Faktor Gruen, Germany
- Freelance Professional in Green Area Design in the Landscaping, Agriculture and Environment Sector, Valencia
- Agricultural Engineer at Floramedia Spain
- Agricultural Engineer by the Polytechnic University of Valencia
- Degree in Environmental Sciences from the Polytechnic University of Valencia
- BDLA-Green Area Design, Hochschule Weihenstephan-Triesdorf University, Germany

Dr. Garcia Nieto, David

- Academic in Atmospheric Sciences
- PhD in Atmospheric Sciences from the Spanish National Research Council (CSIC) and the Polytechnic University of Madrid
- Specialist in Renewable Energy from the Complutense University of Madrid
- Master's Degree in Energy from the Complutense University of Madrid
- Degree in Physics from the Complutense University of Madrid

Dr. Gilsanz Muñoz, María Fuencisla
- Researcher at the European University of Madrid
- Technical Director of Quality Control at Coca-Cola
- Clinical Analysis Laboratory Technician at Laboratorio Ruiz-Falcó, Madrid
- PhD in Biomedicine and Health Sciences from the European University of Madrid
- Degree in Chemical Sciences, National Distance Education University (UNED)
- Diploma in Physical Sciences, National Distance Education University (UNED)

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

Mr. Gómez Guerrero, Pedro
- Research trainee at the Institute of Physical and Information Technologies of CSIC
- Degree in Physics from the European University of Madrid (final year student)
- Summer course Unizar Astrophysics of the Center for the Study of the Physics of the Cosmos of Aragon
- Courses in astronomy, astrophysics at AAHU and Espacio 0.42, Huesca

Mr. Martínez Fanals, Rubén
- Chief Financial Officer at REAL Infrastructure Capital Partners, United States
- Product Marketing Manager at Alstom Renewable Power
- Sales Engineer at Gamesa Eólica
- Account Manager at ThyssenKrupp Rothe Erde
- Executive Program in Algorithmic Trading (EPAT) by Quantinsti
- Certification in Advanced Financial Modelling by Full Stack Modeller
- Certification in Essential Financial Modelling by Gridlines
- Master's Degree in Renewable Energies by the University of Zaragoza
- Degree in Chemical Engineering from the University of Zaragoza
- Diploma in Business Administration and Management from Columbus IBS

A unique, key, and decisive educational experience to boost your professional development"

05

Structure and Content

By completing this university program, engineers will have a solid understanding of the fundamentals of solar energy and photovoltaic technology. Consisting of 10 specialized modules, the program will analyze factors ranging from the site location of photovoltaic installations or economic aspects to design software. It will also provide graduates with the most innovative sizing optimization strategies. In line with this, students will develop advanced skills to diagnose and repair failures in various photovoltaic systems, ensuring their efficient operation at all times.

You will design efficient and sustainable photovoltaic systems for a wide range of applications"

Module 1. Photovoltaic Installations

1.1. Photovoltaic Technology
 1.1.1. International Evolution of Installed Power
 1.1.2. Cost Evolution
 1.1.3. Potential Markets
1.2. Photovoltaic Installations
 1.2.1. According to their Access to the Grid
 1.2.2. According to Network Integration Requirements
 1.2.3. According to their Storage Capacity
 1.2.4. Within Energy Communities
1.3. Photovoltaic Plants
 1.3.1. Low Voltage and High-Voltage Photovoltaic Plants
 1.3.2. Photovoltaic Plants according to the Type of Inverters
 1.3.3. Other uses of Photovoltaic Plants: Agrivoltaics
1.4. Photovoltaic Plants for Self-Consumption
 1.4.1. Individual Installations Without Storage
 1.4.2. Collective Installations Without Storage
 1.4.3. Installations with Storage
1.5. Photovoltaic Installations in Off-Grid Buildings: Components
 1.5.1. Direct Current Installations
 1.5.2. Alternating Current Installations
 1.5.3. Installations in Off-Grid Communities
1.6. Photovoltaic Water Pumping Systems
 1.6.1. Direct Current Installations
 1.6.2. Alternating Current Installations
 1.6.3. Storage Alternatives
1.7. Photovoltaic Hybridization with other Renewable Technologies
 1.7.1. Photovoltaic and Wind Installations
 1.7.2. Photovoltaic and Thermosolar Installations
 1.7.3. Other Hybridizations: Biomass, Tidal Energy
1.8. Photovoltaic Hybridization with other Conventional Technologies
 1.8.1. Photovoltaic Installations and Generating Sets
 1.8.2. Photovoltaic Installations and Cogeneration
 1.8.3. Other Hybridizations
1.9. Architectural Integration of Photovoltaic Installations. BIPV and BAPV
 1.9.1. Advantages and Disadvantages of Integration
 1.9.2. Integration into the Building Envelope. Roofs, Facades
 1.9.3. Integration in Windows
1.10. Technological Innovation
 1.10.1. Innovation as a Value
 1.10.2. Current Trends in Photovoltaic Technology
 1.10.3. Current Trends in Other Complementary Technologies

Module 2. Direct Current Photovoltaic Installations

2.1. Solar Cell Technologies
 2.1.1. Solar Technologies
 2.1.2. Evolution by Technology
 2.1.3. Comparative Analysis of the main Commercial Technologies
2.2. Photovoltaic Modules
 2.2.1. Electrical Technical Parameters
 2.2.2. Other Technical Parameters
 2.2.3. Technical Regulatory Framework
2.3. Photovoltaic Module Selection Criteria
 2.3.1. Technical Criteria
 2.3.2. Economic Criteria
 2.3.3. Other Criteria
2.4. Optimizers and Regulators
 2.4.1. Optimizers
 2.4.2. Regulators
 2.4.3. Advantages and Disadvantages
2.5. Battery Technologies
 2.5.1. Types of Cells
 2.5.2. Evolution by Technology
 2.5.3. Comparative Analysis of the main Commercial Technologies

2.6. Technical Parameters of Batteries
- 2.6.1. Technical Parameters of Lead-Acid Batteries
- 2.6.2. Technical Parameters of Lithium Batteries
- 2.6.3. Durability, Degradation and Efficiency

2.7. Batteries Selection Criteria
- 2.7.1. Technical Criteria
- 2.7.2. Economic Criteria
- 2.7.3. Other Criteria

2.8. Direct Current Electrical Protections
- 2.8.1. Protection Against Direct and Indirect Contacts
- 2.8.2. Protection Against Overvoltage
- 2.8.3. Other Protections
  - 2.8.3.1. Grounding, Insulation, Overload and Short-Circuit Systems

2.9. Direct Current Wiring
- 2.9.1. Type of Wiring
- 2.9.2. Wiring Selection Criteria
- 2.9.3. Dimensioning of Wiring, Conduits, Cable Ducts, Cable Boxes

2.10. Fixed and Solar Tracking Structures
- 2.10.1. Types of Structures with Solar Tracking. Materials
- 2.10.2. Types of Structures with Solar Tracking. One or Two Axes
- 2.10.3. Advantages and Disadvantages of the Type of Solar Tracking

Module 3. Alternating Current Photovoltaic Installations

3.1. Inverter Technology
- 3.1.1. The Inverter Technology
- 3.1.2. Evolution by Technology
- 3.1.3. Comparative Analysis of the main Commercial Technologies

3.2. Technical Parameters of the Inverters
- 3.2.1. Electrical Technical Parameters
- 3.2.2. Other Technical Parameters
- 3.2.3. International Normative Framework

3.3. Inverters Selection Criteria
- 3.3.1. Technical Criteria
- 3.3.2. Economic Criteria
- 3.3.3. Other Criteria

3.4. Transformer Technology
- 3.4.1. Classification of Transformer Technologies
- 3.4.2. Evolution by Technology
- 3.4.3. Comparative Analysis of the main Commercial Technologies

3.5. Technical Parameters of Transformers
- 3.5.1. Electrical Technical Parameters
- 3.5.2. High-Voltage Switchgear: Switches, Disconnectors and Self-Operated Valves
- 3.5.3. International Normative Framework

3.6. Transformers Selection Criteria
- 3.6.1. Technical Criteria
- 3.6.2. Economic Criteria
- 3.6.3. Other Criteria

3.7. Alternating Current (AC) Electrical Protections
- 3.7.1. Protection Against Indirect Contacts
- 3.7.2. Protection Against Overvoltage
- 3.7.3. Other Protections: Grounding, Overload and Short-Circuit Systems

3.8. Alternating Current and Low Voltage Wiring
- 3.8.1. Type of Wiring
- 3.8.2. Wiring Selection Criteria
- 3.8.3. Wire Sizing. Conduits, Manholes

3.9. High-Voltage Wiring
- 3.9.1. Type of Wiring, Poles
- 3.9.2. Wiring Selection Criteria, Layouts, Poles, Declaration of Public Utility
- 3.9.3. Wire Sizing

3.10. Civil Works
- 3.10.1. Civil Works
- 3.10.2. Accesses, Rainwater Outlets Drainage, Enclosures, etc.
- 3.10.3. Electrical Evacuation Networks. Transport Capacity

Module 4. Location of Photovoltaic Installations

4.1. Solar Radiation
- 4.1.1. Quantities and Units
- 4.1.2. Interaction with the Atmosphere
- 4.1.3. Radiation Components

4.2. Sun's Trajectories
- 4.2.1. Sun's Movement. Solar Time
- 4.2.2. Parameters that Determine the Sun's Position
- 4.2.3. Incidence of Sun's Movement on the Shade

4.3. Terrestrial and Satellite Databases
- 4.3.1. Terrestrial Databases
- 4.3.2. Satellite Databases
- 4.3.3. Advantages and Disadvantages

4.4. Radiation Calculation on Tilted Surfaces
- 4.4.1. Methodology
- 4.4.2. Global Radiation Calculation Exercise I. Effect of Latitude and Tilt on Photovoltaic Systems
- 4.4.3. Global Radiation Calculation Exercise II. Self-Calibration Systems

4.5. Other Environmental Factors
- 4.5.1. Influence of Temperature
- 4.5.2. Influence of Wind
- 4.5.3. Influence of Other Factors: Humidity, Condensation, Dust, Altitude.

4.6. Influence of Soiling on the Photovoltaic Solar Field
- 4.6.1. Types of Soiling
- 4.6.2. Losses due to Soiling
- 4.6.3. Strategies and Methods to Avoid Losses due to Soiling

4.7. Influence of Shading on the Photovoltaic Solar Field
- 4.7.1. Shading Types
- 4.7.2. Losses due to Shading
- 4.7.3. Strategies and Methods to Avoid Losses Due to Shade

4.8. Influence of Other Factors: Theft, Lightning
- 4.8.1. Lightning Risk: Overvoltages
- 4.8.2. Total or Partial Risk of Theft: Module, Wiring
- 4.8.3. Prevention Measures

4.9. Site Location Selection Criteria for Photovoltaic Plants
- 4.9.1. Technical Criteria
- 4.9.2. Environmental Criteria
- 4.9.3. Other Criteria: Administrative and Financial

4.10. Site Location Selection Criteria for Self-Consumption and Off-Grid Systems
- 4.10.1. Technical and Architectural Integration Criteria
- 4.10.2. Photovoltaic Generator Tilt(s) and Orientation(s)
- 4.10.3. Other Criteria: Accessibility, Safety, Shading, Soiling

Module 5. Economic, Administrative and Environmental Aspects of Photovoltaic Plants

5.1. Economic Analysis of Photovoltaic Plants
- 5.1.1. Economic Analysis of Investments
- 5.1.2. Economic Analysis of Operation and Maintenance
- 5.1.3. Economic Analysis of Financing

5.2. Project Cost Structures
- 5.2.1. Investment Costs
- 5.2.2. Replacement Costs
- 5.2.3. Operation and Maintenance Costs

5.3. Economic Feasibility Indicators
- 5.3.1. Technical Indicators. Performance Ratio
- 5.3.2. Economic Indicators
- 5.3.3. Estimation of Indicators

5.4. Project Income
- 5.4.1. Project Income
- 5.4.2. Financial Savings
- 5.4.3. Residual Value

5.5. Tax Aspects of the Project
- 5.5.1. Taxation of Electricity Generation
- 5.5.2. Taxation of Profits
- 5.5.3. Tax Deductions for Renewable Investments

5.6. Project Risks and Insurance
- 5.6.1. General Insurance: Investment, Equipment, Production
- 5.6.2. Guarantees and Security Deposits
- 5.6.3. Equipment and Production Guarantees in Contracts

5.7. Administrative Procedures (I): Public Administration
- 5.7.1. Guarantees and Land Contracts
- 5.7.2. Technical Report and/or Project
- 5.7.3. Prior Technical and Environmental Authorizations

5.8. Administrative Procedures (II): Electricity Companies
- 5.8.1. Prior Access and Connection Authorizations
- 5.8.2. Start-up Authorizations
- 5.8.3. Reviews and Inspections

5.9. Access and Connection to Electrical Grids
- 5.9.1. Photovoltaic Plants
- 5.9.2. Self-Consumption Installations
- 5.9.3. Processing

5.10. Environmental Procedures
- 5.10.1. International Environmental Law
- 5.10.2. Protection of Birdlife in Electrical Power Grids
- 5.10.3. Environmental Assessment and Corrective Measures

Module 6. Large Photovoltaic Plant Design

6.1. Climate and Topographic Data, Power, Other Data
- 6.1.1. Peak and/or Nominal Power
- 6.1.2. Climate and Topographic Data
- 6.1.3. Other Data: Required Floor Area, Access and Connection Network, Easements

6.2. Selection of the Photovoltaic Plant Layout
- 6.2.1. Analysis of Solar Tracking Systems
- 6.2.2. Topology of Inverters: Central or String
- 6.2.3. Alternative Uses: Agrivoltaics

6.3. Dimensioning of Components in DC
- 6.3.1. Solar Field Sizing
- 6.3.2. Solar Tracker Sizing
- 6.3.3. Wiring and Protection Sizing

6.4. AC/HV Component Sizing
- 6.4.1. Inverter Sizing
- 6.4.2. Other Elements: Monitoring, Control and Counters
- 6.4.3. Wiring and Protection Sizing

6.5. AC/HV Component Sizing
- 6.5.1. Transformers Sizing
- 6.5.2. Other Elements: Monitoring, Control and Counters
- 6.5.3. High-Voltage Wiring and Protection Sizing

6.6. Energy Yield Estimation
- 6.6.1. Daily, Monthly and Annual Yield
- 6.6.2. Production Parameters: Performance Ratio
- 6.6.3. Strategies for Sizing Optimization. Peak and Nominal Power Ratio

6.7. Monitoring of Variables
- 6.7.1. Identification of Variables to be Monitored
- 6.7.2. Strategies for Alarm Issuance
- 6.7.3. Alternative Monitoring and Alarms for the Photovoltaic Plant

6.8. Grid Integration
- 6.8.1. Electrical Quality
- 6.8.2. Grid Codes
- 6.8.3. Control Centers

6.9. Safety and Health of Photovoltaic Plants
- 6.9.1. Risk Analysis
- 6.9.2. Prevention Measures
- 6.9.3. Protection Measures

6.10. Examples of Photovoltaic Plant Design
- 6.10.1. Plant Design with Central and Fixed Inverter
- 6.10.2. Plant Design with Single-Phase Photovoltaic Module, with Inverter by String and Single-Axis Tracker
- 6.10.3. Plant Design with Bifacial Photovoltaic Module, with Inverter

by String and Single-Axis Tracker

Module 7. Self-Consumption Photovoltaic Installation Design

7.1. Off-Grid and Self-Consumption Systems
- 7.1.1. Electricity Cost Structure. Fees
- 7.1.2. Climate Data
- 7.1.3. Restrictions: Urbanistic

7.2. Characterization of Demand Profiles
- 7.2.1. Electrification of Demand
- 7.2.2. Profile Modification Alternatives
- 7.2.3. Estimation of the Design Demand Profile

7.3. Site Selection and Layout
- 7.3.1. Restrictions: Exterior Surfaces, Slopes, Orientations, Accessibility
- 7.3.2. Surplus Management. Virtual or Real Battery, Diversion to Equipment.
- 7.3.3. Selection of the Installation Scheme

7.4. Solar Field Tilt and Orientation
- 7.4.1. Optimal Tilt of the Solar Field
- 7.4.2. Optimal Orientation of the Solar Field
- 7.4.3. Management of Multiple Tilt/Orientation

7.5. Dimensioning of Components in DC
- 7.5.1. Solar Field Sizing
- 7.5.2. Solar Tracker Sizing
- 7.5.3. Wiring and Protection Sizing

7.6. AC Component Sizing
- 7.6.1. Inverter Sizing
- 7.6.2. Other Elements: Monitoring, Control and Counters
- 7.6.3. Wiring and Protection Sizing

7.7. Energy Yield Estimation
- 7.7.1. Daily, Monthly and Annual Yield
- 7.7.2. Production Parameters: Self-Consumption, Surplus
- 7.7.3. Strategies for Sizing Optimization. Peak and Nominal Power Ratio

7.8. Coverage of Demand
- 7.8.1. Demand Classification: Fixed and Variable
- 7.8.2. Demand Management
- 7.8.3. Demand Coverage Ratios. Optimization

7.9. Surplus Management
- 7.9.1. Surplus Appraisal
- 7.9.2. Derivation of Surplus to Real or Virtual Storage
- 7.9.3. Derivation of Surplus to Regulated Loads

7.10. Design Examples of Self-Consumption Photovoltaic Installations
- 7.10.1. Design of Individual Self-Consumption Photovoltaic Installation, with Surplus and without Batteries
- 7.10.2. Design of Individual Self-Consumption Photovoltaic Installation, with Surplus and with Batteries
- 7.10.3. Design of a Collective Self-Consumption Photovoltaic Installation, without Surplus

Module 8. Off-Grid Photovoltaic Installation Design

8.1. Context and Applications of On-Grid Photovoltaic Installations
- 8.1.1. Energy Supply Alternatives
- 8.1.2. Social Aspects
- 8.1.3. Applications

8.2. Characterization of the Demand of On-Grid Photovoltaic Installations
- 8.2.1. Demand Profiles
- 8.2.2. Service Quality Requirements
- 8.2.3. Continuity of Supply

8.3. Settings and Layout of Off-Grid Photovoltaic Installations
- 8.3.1. Location
- 8.3.2. Settings
- 8.3.3. Detailed Schemes

8.4. Component Functionalities of Off-Grid Photovoltaic Installations
- 8.4.1. Generation, Storage, Control
- 8.4.2. Conversion, Monitoring
- 8.4.3. Management and Consumption

8.5. Component Sizing of Off-Grid Photovoltaic Installations
- 8.5.1. Solar Generator-Accumulator-Inverter Sizing
- 8.5.2. Battery Sizing
- 8.5.3. Sizing of Other Components

8.6. Energy Yield Estimation
- 8.6.1. Solar Generator Production
- 8.6.2. Storage
- 8.6.3. End-Use Production

8.7. Coverage of Demand
- 8.7.1. Solar Photovoltaic Coverage
- 8.7.2. Auxiliary Generator Coverage
- 8.7.3. Energy Losses

8.8. Demand Management
- 8.8.1. Demand Characterization
- 8.8.2. Demand Modification. Variable Loads
- 8.8.3. Demand Substitution

8.9. Particularization for DC and AC Pumping Installations
- 8.9.1. Storage Alternatives
- 8.9.2. Coupling of Motor- Pump- hotovoltaic Generator Group
- 8.9.3. Water Pumping Market

8.10. Design Examples Stand-Alone Photovoltaic Installations
- 8.10.1. Photovoltaic Installation Design for an Individual Off-Grid House
- 8.10.2. Photovoltaic Installation Design for Community Off-Grid Houses
- 8.10.3. Photovoltaic Installation Design and Generator Set for an Individual Off-Grid House

Module 9. Design, Simulation and Sizing Software

9.1. Photovoltaic Installation Design and Simulation Software on the Market
- 9.1.1. Design and Simulation Software
- 9.1.2. Required, Relevant Data
- 9.1.3. Advantages and Disadvantages

9.2. Practical Application of the PVGIS Software
- 9.2.1. Objectives. Data Screens
- 9.2.2. Product and Climate Database
- 9.2.3. Practical Applications

9.3. Software PVSYST
- 9.3.1. Alternatives
- 9.3.2. Product Database
- 9.3.3. Climate Database

9.4. PVSYST Program Data
- 9.4.1. Inclusion of New Products
- 9.4.2. Inclusion of Climate Databases
- 9.4.3. Project Simulation

9.5. PVSYST Program Management
- 9.5.1. Alternative Selection
- 9.5.2. Shading Analysis
- 9.5.3. Result Screens

9.6. Practical Application of the PVSYST : Photovoltaic Plant
- 9.6.1. Application for Photovoltaic Plant
- 9.6.2. Solar Generator Optimization
- 9.6.3. Optimization of Other Components

9.7. Example of Application with PVSYST
- 9.7.1. Example of Application for a Photovoltaic Plant
- 9.7.2. Example of Application for Self-Consumption Photovoltaic Installation
- 9.7.3. Example of Application for a Stand-Alone Photovoltaic Installation

9.8. SAM (System Advisor Model) Program
- 9.8.1. Objective Data Screens
- 9.8.2. Product and Climate Database
- 9.8.3. Result Screens

9.9. Practical Application of the SAM
- 9.9.1. Application for Photovoltaic Plant
- 9.9.2. Application for Self-Consumption Photovoltaic Installation
- 9.9.3. Application for Stand-Alone Photovoltaic Installation

9.10. Example of Application with SAM
- 9.10.1. Example of Application for a Photovoltaic Plant
- 9.10.2. Example of Application for Self-Consumption Photovoltaic Installation
- 9.10.3. Example of Application for a Stand-Alone Photovoltaic Installation

Module 10. Assembly, Operation and Maintenance of Photovoltaic Plants

10.1. Assembly of Photovoltaic Plants
- 10.1.1. Health and Safety
- 10.1.2. Selection of Equipment on the Market
- 10.1.3. Incident Management

10.2. Commissioning of Photovoltaic Plants. Technical Aspects
- 10.2.1. Commissioning Operations
- 10.2.2. Grid Codes. Control Center
- 10.2.3. Incident Management. Thermography, Electroluminescence, Certifications

10.3. Commissioning of Self-Consumption Installations. Technical Aspects
- 10.3.1. Commissioning Operations
- 10.3.2. Monitoring
- 10.3.3. Incident Management. Thermography, Electroluminescence, Certifications

10.4. Commissioning of Off-Grid Installations. Technical Aspects
- 10.4.1. Commissioning Operations
- 10.4.2. Monitoring
- 10.4.3. Incident Management

10.5. Operation and Maintenance Strategies for Photovoltaic Plants
- 10.5.1. Operation Strategies
- 10.5.2. Maintenance Strategies. Fault Detection
- 10.5.3. Internal and External Incident Management

10.6. Operation and Maintenance Strategies for Self-Consumption Installations without Batteries.
- 10.6.1. Operation Strategies. Surplus Management
- 10.6.2. Maintenance Strategies. Fault Detection
- 10.6.3. Internal and External Incident Management

10.7. Operation and Maintenance Strategies for Self-Consumption Installations with Batteries.
- 10.7.1. Operation Strategies. Surplus Management
- 10.7.2. Maintenance Strategies. Fault Detection
- 10.7.3. Internal and External Incident Management

10.8. Operation and Maintenance Strategies for Stand-Alone Installations
    10.8.1. Operation Strategies
    10.8.2. Maintenance Strategies. Fault Detection
    10.8.3. Internal and External Incident Management
10.9. Health and Safety during Assembly, Operation and Maintenance
    10.9.1. Working at Heights. Roofs, Electric Poles
    10.9.2. High Voltage Works
    10.9.3. Other Works
10.10. As Built-Project Documentation
    10.10.1. Commissioning Documents
    10.10.2. Final Certifications
    10.10.3. Modifications and As-Built Project

"You will achieve your professional goals thanks to this unique qualification, which provides you with the latest knowledge in Photovoltaic Solar Energy. Enroll now and experience a quality leap in your career!"

06
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.

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

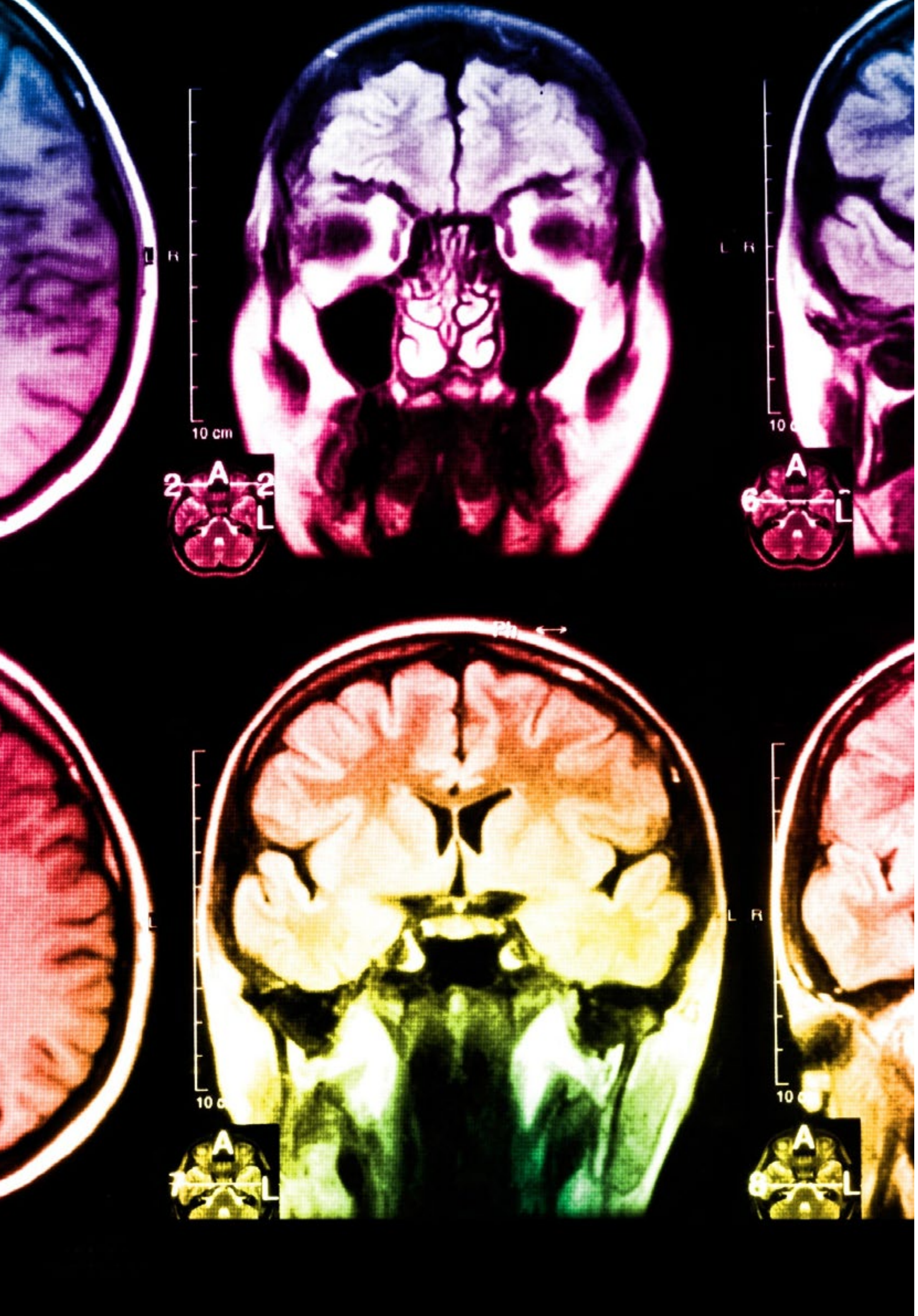
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

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.

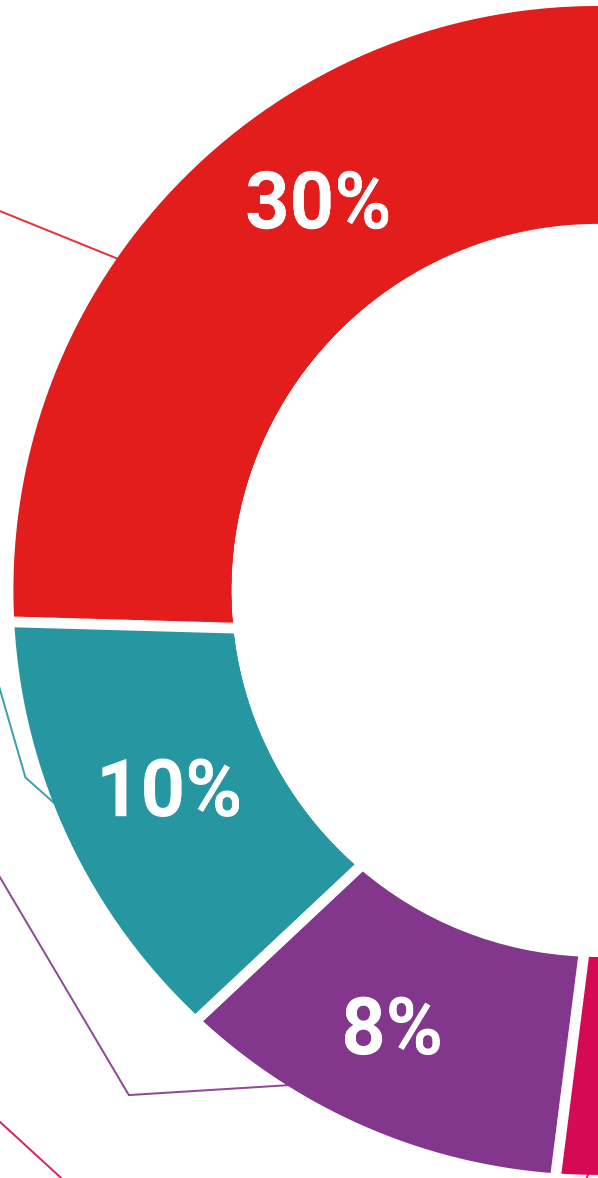
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

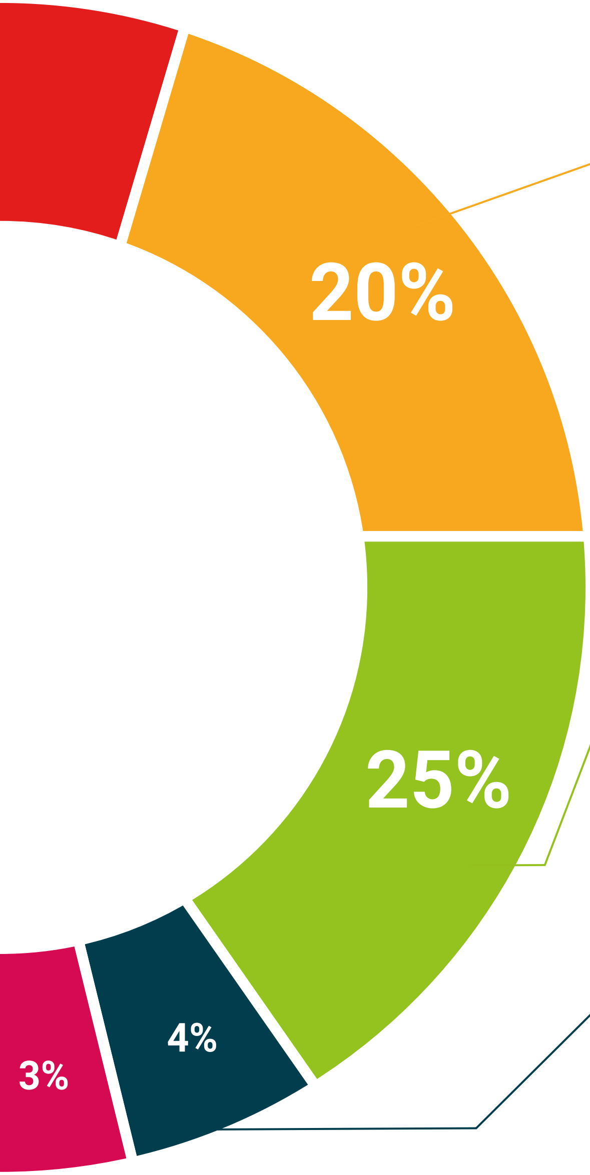
Practising Skills and Abilities

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.

07

Certificate

The Professional Master's Degree in Photovoltaic Solar Energy guarantees students, in addition to the most rigorous and up-to-date education, access to a Professional Master's Degree diploma issued by TECH Global University.

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 **Professional Master's Degree diploma in Photovoltaic Solar Energy** 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: **Professional Master's Degree in Photovoltaic Solar Energy**

Modality: **online**

Duration: **12 months**

Accreditation: **60 ECTS**

tech global university

Mr./Ms. _________________, with identification document ____________
has successfully passed and obtained the title of:

Professional Master's Degree in Photovoltaic Solar Energy

This is a private qualification of 1,800 hours of duration equivalent to 60 ECTS, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH Global University is a university officially recognized by the Government of Andorra on the 31st of January of 2024, which belongs to the European Higher Education Area (EHEA).

In Andorra la Vella, on the 28th of February of 2024

Dr. Pedro Navarro Illana
Dean

This qualification must always be accompanied by the university degree issued by the competent authority to practice professionally in each country. Unique TECH Code: AFWORD23S techtitute.com/certificates

Professional Master's Degree in Photovoltaic Solar Energy

General Structure of the Syllabus

Subject type	ECTS
Compulsory (CO)	60
Optional (OP)	0
External Work Placement (WP)	0
Master's Degree Thesis (MDT)	0
	Total 60

General Structure of the Syllabus

Year	Subject	ECTS	Type
1º	Photovoltaic Installations	6	CO
1º	Direct Current Photovoltaic Installations	6	CO
1º	Alternating Current Photovoltaic Installations	6	CO
1º	Location of Photovoltaic Installations	6	CO
1º	Economic, Administrative and Environmental Aspects of Photovoltaic Plants	6	CO
1º	Large Photovoltaic Plant Design	6	CO
1º	Self-Consumption Photovoltaic Installation Design	6	CO
1º	Off-Grid Photovoltaic Installation Design	6	CO
1º	Design, Simulation and Sizing Software	6	CO
1º	Assembly, Operation and Maintenance of Photovoltaic Plants	6	CO

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Dean

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*Apostille Convention. In the event that the student wishes to have their paper diploma issued with an apostille, TECH Global University will make the necessary arrangements to obtain it, at an additional cost.

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Professional Master's Degree
Photovoltaic Solar Energy

- » Modality: **online**
- » Duration: **12 months**
- » Certificate: **TECH Global University**
- » Accreditation: **60 ECTS**
- » Schedule: **at your own pace**
- » Exams: **online**

Professional Master's Degree
Photovoltaic Solar Energy