Advanced Master's Degree

Renewable Energies and Sustainability in Building

tech technological university

Advanced Master's Degree
Renewable Energies and Sustainability in Building

- Modality: **online**
- Duration: **2 years**
- Certificate: **TECH Technological University**
- Dedication: **16h/week**
- Schedule: **at your own pace**
- Exams: **online**

Website: **www.techtitute.com/us/engineering/advanced-master-degree/advanced-master-degree-renewable-energies-suistainability-building**

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01

Introduction

Renewable Energies are in full expansion at the international level and their use extends to practically all sectors. Increased environmental awareness has resulted in us all embracing a greener lifestyle and, therefore, Clean Energy has also reached the field of Building and Construction, requiring more and more engineers who have the ability to manage them and use the most appropriate ones for each project. Therefore, with this TECH program we offer superior education in this field, thanks to this extensive specialization that includes the most important aspects of Renewable Energies and Sustainability in Building.

In this Advanced Master's Degree, we give you the keys to the use of Renewable Energies in Building, in an intensive and complete specialization. Undoubtedly a unique study opportunity that musn't be missed"

The Advanced Master's Degree in Renewable Energies and Sustainability in Building has been created as additional learning for engineers, as it includes the main innovations in two fields that, although they may seem very different, are increasingly linked: Renewable Energies and Building. Consequently, considering the installation of clean energy sources when creating new facilities will make a more reasonable use of resources, favoring energy savings and sustainability.

It is necessary to take into account that Renewable Energies are in constant growth, so the market demands more and more engineering professionals who are able to apply them to the Building sector, achieving long-term benefits not only for the environment, but also for family finances. In order to offer a superior and high quality specialization to these professionals, this program will provide an insight into the main Renewable Energies so students can understand the current situation in the world energy market and its regulatory framework at the international level, as well as the different parties involved in the financing, management and operation of Renewable Energy projects. It will also cover energy saving in Building, addressing the full range of issues involved in the field, both in the residential and tertiary sectors.

Throughout this specialization, the student will learn all of the current approaches to the different challenges posed by their profession. A highly-skilled program that will result in an improvement, not only on a professional level, but also on a personal level. Additionally, at TECH we have a social commitment: to help highly qualified professionals to specialize and develop their personal, social and professional skills throughout the course of their studies.

Therefore, we will not only take you through the theoretical knowledge the program offers, but we will also show you another way of studying and learning that is more organic, simpler and efficient. At TECH we work to keep students motivated, to create a passion for learning and to develop critical thinking.

This Advanced Master's Degree is designed to give you access to the specific knowledge in the discipline in an intensive and practical way which will be of great value for any professional. Furthermore, as it is a 100% online specialization, the student decides when and where to study. Without the restrictions of fixed timetables or having to move between classrooms, this course can be combined with work and family life.

This **Advanced Master's Degree in Renewable Energies and Sustainability in Building** contains the most complete and up-to-date program on the market. The most important features include:

- The latest technology in e-learning software
- Intensely visual teaching system, supported by graphic and schematic contents that are easy to assimilate and understand
- The development of practical case studies presented by practising experts
- State-of-the-art interactive video systems
- Teaching supported by telepractice
- Continuous updating and recycling systems
- Self-regulated learning: full compatibility with other occupations
- Practical exercises for self-assessment and learning verification
- Support groups and educational synergies: questions to the expert, debate and knowledge forums
- Communication with the teacher and individual reflection work
- Content that is accessible from any fixed or portable device with an Internet connection
- Complementary resource banks that are permanently available

A highly scientific training program, supported by advanced technological development and the teaching experience of the best professionals"

A program created for professionals who aspire to excellence that will allow you to acquire new skills and strategies in a smooth and effective way"

A deep and comprehensive look at the most up-to-date strategies and approaches in Renewable Energies and Sustainability in Building.

The implementation of renewable energies in buildings is essential to help improve the environment and achieve greater energy and economic savings.

Our teaching staff is made up of working professionals. That way we can be sure to offer you the up-to-date information we aim to provide. A multidisciplinary team of professionals with training and experience in different environments, who will develop the theoretical knowledge in an efficient way, but above all, they will bring their practical knowledge from their own experience to the course.

This command of the subject is complemented by the effectiveness of the methodological design of this Advanced Master's Degree. Developed by a multidisciplinary team of e-learning experts, it integrates the latest advances in educational technology. In this way, professionals will be able to study with a range of comfortable and versatile multimedia tools that will give them the operability they need in their training.

The design of this program is based on Problem-Based Learning, an approach that conceives learning as a highly practical process. To achieve this remotely, TECH will use telepractice. With the help of an innovative, interactive video system and learning from an expert, you will be able to acquire the knowledge as if you were dealing with the case you are studying in real time. A concept that will allow students to integrate and fix learning in a more realistic and permanent way.

02

Objectives

Our objective is to train highly qualified professionals for the working world. An objective that is also complemented, in a global manner, by promoting human development that lays the foundations for a better society. This objective is made a reality by helping professionals reach a much higher level of expertise and control. A goal that students will be able to achieve thanks to a highly intensive and detailed course.

If your goal is to improve in your profession, to acquire a qualification that will enable you to compete among the best, then look no further: Welcome to TECH"

General objectives

- Conduct an exhaustive analysis of current legislation and the energy system, from electricity generation to the consumption phase, as well as the fundamental production factor in the economic system and the functioning of the different energy markets
- Identify the different phases required for the feasibility and implementation of a Renewable Energy project and its commissioning
- Analyze the different technologies and manufacturers available to create Renewable Energy exploitation systems in depth, and distinguish and critically select those qualities according to costs and their actual implementation
- Identify the operation and maintenance tasks required for the correct operation of Renewable Energy facilities
- Size facilities for the application of all energy sources of lesser implementation such as mini-hydro, geothermal, tidal and clean vectors
- Manage and analyze relevant bibliography on a topic related to one or some of the areas of renewable energies, published at the international level
- Adequately interpret society's expectations on the environment and climate change, and engage in technical discussions and critical opinions on energy aspects of sustainable development, as skills that Renewable Energy professionals should have
- Integrate knowledge and face the complexity of formulating reasoned judgments in the field applicable to a company in the Renewable Energy sector
- Master the different existing solutions or methodologies for the same problem or phenomenon related to Renewable Energies and develop a critical spirit knowing the practical limitations
- Understand the impact of energy consumption in cities and of the main structures that make it function, the buildings
- Gain deeper knowledge of energy consumption and demand, as these are the key conditioning factors for a building to be energetically comfortable
- Provide students with general knowledge of the different norms, standards, regulations and existing legislation, which will allow them to deepen in the specific ones that concern the procedures for energy saving actions in buildings
- Offer fundamental knowledge for support in the rest of the modules and related information search tools
- Apply the key aspects of the circular economy in buildings using life cycle and carbon footprint analysis tools to establish plans for the reduction of environmental impact, as well as to meet the criteria of green public procurement
- Train students to carry out energy audits in accordance with EN 16247-2, provide energy services and energy certification in order to establish improvement measures to increase energy savings and sustainability in buildings
- Delve deeper into the importance of the architectural tools that will make possible the maximum use of the climatic environment of a building
- Carry out exhaustive analysis on renewable energy techniques. This will allow students to have the skills and vision to design the best options for choosing an energy source in terms of available resources
- Internalize and delve deeper into self-consumption, as well as the advantages of its installation in buildings
- Choose the most efficient equipment and detect deficiencies in electrical installations to reduce consumption, optimize functioning and establish a culture of energy efficiency in the organization
- Design electric vehicle charging point infrastructures for their implementation in buildings

- Delve deeper into the different cold and heat generation systems, more often used today
- Perform a complete analysis of the main maintenance operations of air conditioning equipment, cleaning and replacement of parts
- Thoroughly break down the properties of light involved in building energy saving
- Master and apply the techniques and requirements for the design and calculation of lighting systems, complying with health, visual and energy criteria
- Thoroughly analyze the different control systems installed in buildings, the differences between them, the applicability criteria in each case and the energy savings provided

We are the largest online university in the world and we want to help you improve your future"

Specific objectives

- Delve into the world's energy and environmental situation, as well as that of other countries
- Gain detailed knowledge of the current energy and electricity context from different perspectives: structure of the electricity system, operation of the electricity market, regulatory environment, analysis and evolution of the electricity generation system in the short and medium and long term
- Master the technical-economic criteria of generation systems based on the use of conventional energy: nuclear energy, large hydro, conventional thermal, combined cycle and the current regulatory environment of both conventional and renewable generation systems and their dynamics of evolution
- Apply the knowledge acquired to the understanding, conceptualization and modeling of systems and processes in the field of energy technology, particularly in the field of renewable energy sources
- Effectively pose and solve practical problems, identifying and defining the significant elements that constitute them
- Critically analyze data and reach conclusions in the field of energy technology
- Use the acquired knowledge to conceptualize models, systems and processes in the field of energy technology
- Analyze the potential of Renewable Energies and energy efficiency from multiple perspectives: technical, regulatory, economic and market
- Gain the ability to search for information on public websites related to the electricity system and to elaborate this information
- Make an in-depth analysis of hydrology and the management of water resources related to hydropower
- Implement environmental management mechanisms in the field of hydroelectric energy
- Identify and select the necessary equipment for different types of hydroelectric developments
- Design, dimension and operate of hydroelectric power plants
- Master the elements that make up hydroelectric works and facilities, both in technical and environmental aspects, as well as those connected to operation and maintenance
- Gain detailed knowledge of the current situation and future forecasts of the biomass and/or biofuels sectors in the European context
- Quantify the advantages and disadvantages of this type of Renewable Energy
- Delve into biomass energy utilization systems, i.e., the ways in which energy can be obtained from biomass
- Assess the biomass resources available in a given area, called the study area
- Differentiate the types of energy crops that exist today, their advantages and disadvantages
- Typify the biofuels used today. Understand the processes for obtaining both biodiesel and bioethanol and/or biomethanol
- Conduct comprehensive analyses of legislation and regulations related to biomass and biofuels
- Carry out an economic analysis and gain in-depth knowledge of the legislative and economic frameworks in the biofuels sector
- Select the necessary equipment for different solar thermal applications
- Be able to make a basic design and dimensioning of low and medium temperature solar thermal installations

- Estimate solar radiation at a given geographical location
- Recognize the conditions and restrictions for the application of solar thermal energy
- Assess the advantages and disadvantages of replacing fossil fuels with Renewable Energies in different situations
- Gain in-depth knowledge to implement wind energy systems and the most appropriate types of technology to be used according to location and economic requirements
- Obtain a scientific-technical vocabulary of Renewable Energies
- Correctly develop hypotheses to address problems in the field of Renewable Energies, and the criterion to evaluate results in an objective and coherent manner
- Understand and master the fundamental concepts of wind types and the implementation of wind measurement systems
- Understand and master the fundamental concepts of the general laws governing the capture of wind energy and wind turbine technologies
- Develop wind power plant projects
- Master the specific subject matter required to meet the needs of specialized companies and to become highly qualified professionals in the design, construction, assembly, operation and maintenance of photovoltaic solar energy equipment and facilities
- Apply the knowledge acquired to the understanding, conceptualization and modeling of solar photovoltaic installations
- Synthesize knowledge and research appropriate methodologies for integration into innovation and project development departments in any company in the solar photovoltaic field
- Effectively pose and solve practical problems, identifying and defining the significant elements that constitute them
- Apply innovative methods in solving problems related to photovoltaic solar energy
- Identify, find and obtain data on the Internet related to the context of solar photovoltaic energy
- Design and conduct research based on analysis, modeling and experimentation in the field of solar photovoltaic energy
- Gain in-depth knowledge and handle the specific regulations for photovoltaic solar installations
- Gain in-depth knowledge and select the necessary equipment for different solar photovoltaic applications
- Design, dimension, implement, operate and maintain solar photovoltaic installations
- Master the different technologies to use sea energies
- Gain in-depth knowledge and apply geothermal energy
- Associate the physicochemical properties of hydrogen with its potential use as an energy carrier
- Learn about the use of hydrogen as a renewable energy source
- Identify the most commonly used fuel cells and accumulators to date, highlighting the technological improvements throughout history
- Characterize the different types of fuel cells
- Delve into recent advances in the use of new materials for the manufacture of fuel cells and their most innovative applications
- Classify ATEX zones with hydrogen as fuel

- Analyze the importance of electrical energy storage systems in the current energy sector landscape, showing the impact it has on the planning of generation, distribution and consumption models
- Identify the main technologies available in the market, explaining their characteristics and applications
- Have a transversal vision with other sectors in which the deployment of electric storage systems will have an impact on the configuration of new energy models, with special emphasis on the automotive and electric mobility sectors
- Have an overview of the usual steps followed in the development of projects with storage systems, especially focused on batteries
- Identify the main concepts for the integration of storage systems in power generation systems, especially with photovoltaic and wind systems
- Gain in-depth knowledge and analyze the technical documentation of Renewable Energy projects required for their feasibility, financing and processing
- Manage technical documentation up to the "Ready to Built" step
- Establish types of financing
- Understand and carry out an economic and financial study of a renewable energy project
- Use all the tools for project management and planning
- Master the part of insurance involved in the financing and viability of Renewable Energy projects, both in their construction and operation phases
- Delve into the processes of valuation and appraisal of claims in Renewable Energy assets
- Optimize processes, both in production and in Operations and Maintenance
- Learn in detail about the capabilities of digital industrialization and automation in Renewable Energy installations
- Gain in-depth knowledge and analyze the different alternatives and technologies offered by digital transformation
- Implement and test IoT systems
- Use tools such as Big Data to improve processes and/or energy facilities
- Gain in-depth knowledge of the scope of drones and autonomous vehicles in preventive maintenance
- Learn new forms of energy commercialization: Blockchain and Smart Contracts
- Gain insight into energy in cities
- Identify the importance of a building's energy performance
- Delve into the differences between energy consumption and energy demand
- Analyze in detail the importance of energy comfort and livability
- Identify the responsible bodies and agencies
- Achieve a global vision of current regulations
- Justify the differences between the different documents, whether they are norms, regulations, standards, legislation and their scope of application
- Analyze in detail the main regulations for procedures on energy saving and sustainability in buildings
- Provide tools to search for related information
- Have a comprehensive approach to the circular economy in buildings in order to maintain a strategic vision of implementation and best practices

- Quantify, through life cycle analysis and carbon footprint calculation, the impact of real estate management on sustainability in order to develop improvement plans that allow energy savings and environmental impact reduction in buildings
- Master the criteria of green public procurement in the real estate sector in order to be able to face and manage them with criteria
- Recognize the type of work to be developed depending on the objectives set by the client to recognize the need to perform an energy audit
- Perform an energy audit according to EN 16247-2 to establish an action protocol to determine the initial situation and to propose energy saving options
- Analyze the provision of energy services to know each of their characteristics in defining energy service contracts
- Perform energy certification on buildings to determine the initial energy rating and define improvement options according to standards
- Gain exhaustive knowledge of the structural elements and their effect on building energy efficiency
- Study structural components that allow the use of sunlight and other natural resources and their architectural adaptation
- Detect the connection between buildings and human health
- Deal in detail with the evolution of renewable energies up to their current applications
- Carry out exhaustive studies of applying these energies in today's construction
- Internalize and delve deeper into self-consumption, as well as the advantages of its installation in buildings
- Choose the most efficient equipment to ensure the lowest possible energy consumption in building activity
- Detect and correct defects derived from the existence of harmonics to reduce energy losses in the electrical grid by optimizing its energy transmission capacity
- Design electric vehicle charging infrastructures in the building in compliance with current regulations or specific customer requirements
- Optimize electricity bills to obtain the greatest economic savings according to the building's demand profile
- Implement a culture of energy efficiency to increase energy and economic savings in managing facility activity within property management
- Master the different thermal air conditioning systems and their operation
- Break down their components in detail for machine maintenance
- Analyze the role of energy efficiency in the evolution of different systems
- Apply the principles of lighting technology, its properties, differentiating the aspects that contribute to energy savings
- Analyze the criteria, characteristics and requirements of the different solutions that can arise in buildings
- Design and calculate lighting projects, improving energy efficiency
- Integrate lighting techniques to improve health as a reference in energy savings
- Analyze the different installations, technologies and control systems applied to energy saving in buildings
- Differentiate between the different systems to be implemented, distinguishing the characteristics in each specific case
- Delve deeper into how control installations bring energy savings to buildings by optimizing energy resources
- Master the principles of control systems configuration in buildings

03
Skills

Once all the contents have been studied and the objectives of the Advanced Master's Degree in Renewable Energies and Sustainability in Building have been achieved, professionals will have gained superior expertise and performance in this area. A very complete approach, in an Advanced Master's Degree, which makes the difference.

Achieving excellence in any profession requires effort and perseverance. But, above all, the support of professionals, who will give you the boost you need, with the necessary means and assistance. At TECH, we offer you everything you need"

General skills

- Master the global environment of Renewable Energies, from the international energy context, markets, electricity system structure, to project development, operation and maintenance plans; and sectors such as insurance and asset management
- Apply acquired knowledge and problem-solving skills in current or unfamiliar environments within broader contexts related to renewable energies
- Integrate knowledge and get a thorough understanding of the different sources of renewable energies, as well as the importance of their use in today's world
- Learn to communicate concepts of design, development and management of the different renewable energy systems
- Gain a detailed understanding of the importance of hydrogen as an energy carrier of the future, and large-scale storage within the integration of renewable energy systems
- Understand and internalize the scope of digital and industrial transformation applied to renewable energy systems for their efficiency and competitiveness in the future energy market
- Critically analyze, evaluate and synthesize new and complex ideas related to the field of renewable energies
- Be able to promote, in professional contexts, technological, social or cultural progress within a knowledge-based society
- Understand building energy consumption and carry out actions to reduce it
- Apply specific regulations related to energy saving in buildings
- Perform energy audits in buildings
- Detect and solve problems in electrical installations to save energy consumption

Specific skills

- Gain in-depth knowledge of the potential of renewable energies from multiple perspectives: technical, regulatory, economic and market
- Project, calculate and design products, processes, installations and plants with the most common renewable energies in our environment: wind energy, solar thermal energy, solar photovoltaic, biomass and hydropower
- Conduct research, development and innovation in products, processes and methods related to renewable energy systems
- Follow the technological evolution of renewable energies and have prospective knowledge of this evolution
- Understand the operating principles of the following power generation technologies: solar thermal, mini-hydro, biomass, cogeneration, geothermal, and wave power
- Master the current state of technical and economic development of these technologies
- Understand the role of the main elements of each technology, their relative importance and the constraints imposed by each of them
- Identify the existing alternatives for each technology, as well as the advantages and disadvantages of each of them
- Be able to assess the resource potential and perform basic sizing for solar thermal, mini-hydro and biomass power plants
- Have a transversal vision with other sectors in which the deployment of electric storage systems will have an impact on the configuration of new energy models
- Gain in-depth knowledge of the digital transformation applied to renewable energy systems, as well as the implementation and use of the most important tools
- Discover the impact of a city's energy consumption
- Know the legislation and regulations related to energy saving and sustainability in building and apply them at work
- Develop improvement plans to reduce the environmental impact of buildings
- Apply the EN 16247-2 standard for carrying out audits
- Use natural resources following a bioclimatic architectural adaptation
- Apply renewable energies in building construction
- Apply all the techniques necessary to achieve energy savings in buildings
- Develop and apply efficient air-conditioning systems
- Develop and apply efficient lighting systems
- Use control systems for energy savings

Our objective is very simple: to offer you quality training with the best teaching methods currently available, so you can reach new heights of excellence in your profession"

04
Course Management

For our Advanced Master's Degree to be of the highest quality, we are proud to work with a teaching staff of the highest level, chosen for their proven track record in the field of education. Professionals from different areas and fields of expertise that make up a complete, multidisciplinary team. A unique opportunity to learn from the best.

Our professors bring their vast experience and their teaching skills to offer you a stimulating and creative specialized program"

Management

Mr. De la Cruz Torres, José

- Degree in Physics and Industrial Electronics Engineering, University of Seville
- Master's Degree in Operations Management from EADA Business School Barcelona
- Master's Degree in Industrial Maintenance Engineering, University of Huelva
- Railway Engineering, UNED
- Head of the appraisal, assessment and valuation of technologies and processes of Renewable Energy generation facilities at RTS International Loss Adjusters

Mr. Nieto-Sandoval González- Nicolás, David

- Technical Industrial Engineer from the E.U.P. of Malaga
- Industrial Engineer from E.T.S.I.I.
- Master's Degree in Integral Management of Quality, Environment and Health and Safety at Work from the University of the Balearic Islands
- He has been working for more than 11 years, both for companies and independently, for clients in the private agri-food industrial sector and the institutional sector, as a consultant in engineering, project manager and energy saving in organizations
- Professor certified by the EOI in the areas of industry, entrepreneurship, human resources, energy, new technologies and technological innovation
- Trainer for the European INDUCE project
- Trainer at institutions such as COGITI or COIIM

Mr. Lillo Moreno, Javier

- Telecommunications Engineer, University of Seville
- Master's Degree in Project Management and Master's Degree in Big Data & Business Analytics, School of Industrial Organization (EOI)
- With an extensive professional career (more than 15 years) in the Renewable Energy sector
- Has managed the O&M areas of several companies with high visibility in the sector

Professors

Mr. Álvarez Morón, Gregorio

- Agronomist Engineer specializing in Rural Engineering
- Lecturer in collaboration with WATS Ingeniería, a Spanish company specialized in water, agronomy, energy and environmental engineering
- With more than 15 years of experience in public and private companies

Dr. De la Cal Herrera, José Antonio

- Industrial Engineer, Polytechnical University of Madrid
- MBA in Business Administration and Management from the Higher School of Commercial and Marketing Management, ESIC
- PhD from the University of Jaén
- Former Head of the Renewable Energy Department of AGECAM, S.A., Energy Management Agency of Castilla-La Mancha
- Associate Professor in the Department of Business Organization, University of Jaén

Mr. Díaz Martin, Jonay Andrés

- Senior industrial engineer specialized in Electricity, University of Las Palmas de Gran Canaria
- Master's Degree in International Logistics and Supply Chain Management, EUDE Business School
- Master's Degree in Integrated Management of Prevention, Quality and Environment, Camilo José Cela University

Mr. González Cano, José Luis

- Degree in Optics and Optometry from the Complutense University of Madrid
- Lighting Designer collaborating with companies in the lighting sector in consulting, training, lighting technology projects and implementation of ISO 9001:2015 quality systems (internal auditor)
- Teacher for Vocational Training in electronic systems, telematics (CISCO certified instructor), radio communications, IoT
- Member of the Professional Association of Lighting Designers (Technical Consultant) and member of the Spanish Lighting Committee, who participates in working groups on LEDw technology

Mr. Granja Pacheco, Manuel

- Civil Engineer, Alfonso X El Sabio University
- Master's Degree in Renewable Energy Installation Management and Project Internationalization by ITE (Instituto Tecnológico de la Energía)
- Manages the operations of a company specialized in the development of Renewable Energy projects, with a track record of more than 3,000 MW of projects at national and international level

Dr. Gutiérrez, María Delia

- Chemical Engineer
- Master's Degree in Environmental Systems
- PhD in Engineering Sciences with specialization in Energy and Environment
- Graduated from EGADE Business School with a specialization in Energy Management
- More than 10 years of experience in the areas of energy, sustainability and indicators, mobility, specifically the development of the business unit: natural gas vehicles and design and implementation of water treatment plants

Mr. Montoto Rojo, Antonio

- Electronics Engineering, University of Seville
- MBA from Camilo José Cela University
- Account Manager for storage systems at Gamesa Electric

Mr. Pérez García, Fernando

- Technical Industrial Engineer specialized in Electricity, University of Zaragoza
- Insurance appraiser specialized in the adjustment and appraisal of industrial risks, technical and energy claims, especially in the renewable energy sector (wind, hydro, photovoltaic, solar thermal and biomass)

Ms. Peña Serrano, Ana Belén

- Degree in Technical Engineering in Topography from the Polytechnic University of Madrid
- Master's Degree in Renewable Energies from San Pablo CEU University
- Postgraduate Certificate in Geological Cartography from Universidad Nacional de Educación a Distancia (National University of Distance Education)
- Postgraduate Certificate in Building Energy Certification from Fundación Laboral de la Construcción
- Her experience covers several sectors from working on site, to managing people in human resources
- She collaborates in different scientific communication projects, directing the dissemination in different media in the field of energy
- Member of the work management team for the Master's Degree in Environmental and Energy Management in Organizations at the International University of La Rioja

Mr. Serrano, Ricardo

- Degree in Law from the University of Seville
- He was regional director of Musini from 1996 to 2004 and has worked in the most important brokerage companies worldwide, AON, MARSH Insurance Broker & Risk Management and Willis Towers Watson
- He has participated in the design and placement of insurance programs for renewable energy companies and other industrial activities (Abengoa, Befesa, Atalaya Riotinto, among others)
- Currently serves as the Andalusia Director at Willis Towers Watson, a leader in global consulting, broking and solutions that manage risk, optimize profits, develop talent and enhance capital capacity

Mr. Silvan Zafra, Álvaro

- Energy Engineer, University of Seville
- Master's Degree in Thermal Energy Systems and Business Administration
- Senior Consultant focused on the execution of international E2E projects in the energy sector
- Responsible for the market management of more than 15 GW of installed capacity for clients such as Endesa, Naturgy, Iberdrola, Acciona and Engie

Trillo León, Eugenio

- Industrial Engineer specialized in Energy, University of Seville
- Master's Degree in Industrial Maintenance Engineering, University of Huelva
- Postgraduate Diploma in Project Management, UCLA
- CEO of The Lean Hydrogen Company
- Secretary of the Andalusian Hydrogen Association

Learning that draws on the real-world experience of practicing professionals. Learning is the best way to achieve quality in your profession"

05
Structure and Content

The contents of this Advanced Master's Degree have been developed by the different experts on this course, with a clear purpose: to ensure that our students acquire each and every one of the skills required to become true experts in this field. The content of this Advanced Master's Degree will allow you to learn all aspects of the different disciplines involved in this area. A complete and well-structured program which will take you to the highest standards of quality and success.

Through a very well organized program, you will be able to access the most advanced knowledge of the moment in Renewable Energies and Sustainability in Building"

Module 1. Renewable Energies and Their Current Environment

1.1. Renewable Energies
- 1.1.1. Fundamental Principles
- 1.1.2. Conventional Energy Forms vs. Renewable Energy
- 1.1.3. Advantages and Disadvantages of Renewable Energies

1.2. International Context of Renewable Energies
- 1.2.1. Basics of Climate Change and Energy Sustainability Renewable Energies vs. Non-Renewable Energies
- 1.2.2. Decarbonization of the World Economy From the Kyoto Protocol to the Paris Agreement in 2015 and the 2019 Madrid Climate Summit
- 1.2.3. Renewable Energies in the Global Energy Context

1.3. Energy and International Sustainable Development
- 1.3.1. Carbon Markets
- 1.3.2. Clean Energy Certificates
- 1.3.3. Energy vs. Sustainability

1.4. General Regulatory Framework
- 1.4.1. International Energy Regulation and Directives
- 1.4.2. Auctions in the Renewable Electricity Sector

1.5. Electricity Markets
- 1.5.1. System Operation with Renewable Energies
- 1.5.2. Regulation of Renewable Energies
- 1.5.3. Participation of Renewable Energies in the Electricity Markets
- 1.5.4. Operators in the Electricity Market

1.6. Structure of the Electrical System
- 1.6.1. Generation of the Electrical System
- 1.6.2. Transmission of the Electrical System
- 1.6.3. Distribution and Operation of the Market
- 1.6.4. Marketing

1.7. Distributed Generation
- 1.7.1. Concentrated Generation vs. Distributed Generation
- 1.7.2. Self-Consumption
- 1.7.3. Generation Contracts

1.8. Emitters
- 1.8.1. Measuring Energy
- 1.8.2. Greenhouse Gases in Power Generation and Use
- 1.8.3. Emission Assessment by Type of Energy Generation

1.9. Energy Storage
- 1.9.1. Types of Cells
- 1.9.2. Advantages and Disadvantages of Cells
- 1.9.3. Other Energy Storage Technologies

1.10. Main Technologies
- 1.10.1. Energies of the Future
- 1.10.2. New Uses
- 1.10.3. Future Energy Contexts and Models

Module 2. Hydraulic Energy Systems

2.1. Water, a Natural Resource. Hydraulic Energy
- 2.1.1. Water in Earth. Water Flows and Uses
- 2.1.2. The Cycle of Water
- 2.1.3. First Uses of Hydraulic Energy

2.2. From Hydraulic to Hydroelectric Energy
- 2.2.1. Origin of Hydroelectric Development
- 2.2.2. The Hydroelectric Plant
- 2.2.3. Current Uses

2.3. Types of Hydroelectric Power Plants by Power Output
- 2.3.1. Major Hydraulic Plant
- 2.3.2. Mini and Micro Hydraulic Plant
- 2.3.3. Constraints and Future Prospects

2.4. Types of Hydroelectric Power Plants by Layout
- 2.4.1. Plant at the Foot of a Dam
- 2.4.2. Flowing Plant
- 2.4.3. Conduction Plant
- 2.4.4. Hydroelectric Pump Plant

2.5. Hydraulic Elements of a Plant
- 2.5.1. Catchment and Intake Works
- 2.5.2. Forced Conduit Connection
- 2.5.3. Discharge Conduit

2.6. Electromechanical Elements of a Plant
- 2.6.1. Turbine, Generator, Transformer and Power Line
- 2.6.2. Regulation, Control and Protection
- 2.6.3. Automation and Remote Control

2.7. The Key Element: The Hydraulic Turbine
- 2.7.1. Operation
- 2.7.2. Typology
- 2.7.3. Selection Criteria

2.8. Calculation of Use and Dimensioning
- 2.8.1. Available Power: Flow Rate and Head
- 2.8.2. Electrical Power
- 2.8.3. Performance. Production

2.9. Administrative and Environmental Aspects
- 2.9.1. Benefits and Drawbacks
- 2.9.2. Administrative Procedures. Grants
- 2.9.3. Environmental Impact

2.10. Design and Project of a Mini-Hydroelectric Plant
- 2.10.1. Design of a Mini-Plant
- 2.10.2. Cost Analysis
- 2.10.3. Economic Viability Analysis

Module 3. Biomass and Biofuel Energy Systems

3.1. Biomass as an Energy Resource of Renewable Origin
- 3.1.1. Fundamental Principles
- 3.1.2. Origins, Typologies and Current Uses
- 3.1.3. Main Physical-Chemical Parameters
- 3.1.4. Products Obtained
- 3.1.5. Quality Standards for Solid Biofuels
- 3.1.6. Advantages and Disadvantages of the Use of Biomass in Buildings

3.2. Physical Conversion Processes: Pre-Treatments
- 3.2.1. Justification
- 3.2.2. Types of Processes
- 3.2.3. Cost and Profitability Analysis

3.3. Main Chemical Conversion Processes of Residual Biomass: Products and Uses
- 3.3.1. Thermochemicals
- 3.3.2. Biochemicals
- 3.3.3. Other Processes
- 3.3.4. Analysis of Investment Profitability

3.4. Gasification Technology: Technical and Economic Aspects Advantages and Disadvantages
- 3.4.1. Scope of Application
- 3.4.2. Biomass Requirements
- 3.4.3. Types of Gasifiers
- 3.4.4. Properties of Sythetic Gas or Syngas
- 3.4.5. Uses of Syngas
- 3.4.6. Existing Technologies at Commercial Level
- 3.4.7. Profitability Analysis
- 3.4.8. Advantages and Disadvantages

3.5. Pyrolysis: Products Obtained and Costs Advantages and Disadvantages
- 3.5.1. Scope of Application
- 3.5.2. Biomass Requirements
- 3.5.3. Types of Pyrolysis
- 3.5.4. Resulting Products
- 3.5.5. Cost Analysis (CAPEX and OPEX). Economic Profitability
- 3.5.6. Advantages and Disadvantages

3.6. Biomethanization
- 3.6.1. Scope of Application
- 3.6.2. Biomass Requirements
- 3.6.3. Main Technologies Co-Digestion
- 3.6.4. Products Obtained
- 3.6.5. Uses of Biogas
- 3.6.6. Cost Analysis: Study of Investment Profitability

3.7. Design and Evolution of Biomass Energy Systems
- 3.7.1. Sizing of a Biomass Combustion Plant for Electric Power Generation
- 3.7.2. Biomass Installation in Public Buildings: Sizing and Calculating the Storage System Determining Payback in Case of Substitution by Fossil Fuels (Natural Gas and Diesel C)
- 3.7.3. Calculating Industrial Biogas Production Systems
- 3.7.4. Assessment of Biogas Production at a MSW Landfill Site

3.8. Designing Business Models Based on the Technologies Studied
- 3.8.1. Gasification in Self-Consumption Mode Applied to the Agri-Food Industry
- 3.8.2. Biomass Combustion Using the ESE Model Applied to the Industrial Sector
- 3.8.3. Obtaining Biochar from Olive Oil Sector By-Products
- 3.8.4. Production of Green H2 from Biomass
- 3.8.5. Obtaining Biogas from Olive Oil Industry By-Products

3.9. Analyzing the Profitability of Biomass Projects: Applicable Legislation, Incentives and Financing
- 3.9.1. Structure of Investment Projects: CAPEX, OPEX, Income/Savings, TIR, VAN and Payback
- 3.9.2. Aspects to be Taken Into Account: Electrical Infrastructure, Access, Space Availability, etc.
- 3.9.3. Applicable Legislation
- 3.9.4. Administrative Procedures Plan
- 3.9.5. Incentives and Financing

3.10. Conclusions: Environmental, Social and Energy Aspects Associated with Biomass
- 3.10.1. Bioeconomy and Circular Economy
- 3.10.2. Sustainability: CO2 Emissions Avoided C Sinks
- 3.10.3. Alignment With UN SDGs and Green Pact Goals
- 3.10.4. Employment Generated by Bioenergy. Value Chain
- 3.10.5. Contribution of Bioenergy to the Energy Mix
- 3.10.6. Productive Diversification and Rural Development

Module 4. Solar Thermal Energy Systems

4.1. Solar Radiation and Solar Thermal Systems
- 4.1.1. Fundamental Principles of Solar Radiation
- 4.1.2. Radiation Components
- 4.1.3. Market Evolution in Solar Thermal Systems

4.2. Static Solar Collectors: Description and Efficiency Measurement
- 4.2.1. Collector Classification and Components
- 4.2.2. Losses and Energy Conversion
- 4.2.3. Characteristic Values and Collector Efficiency

4.3. Applications of Low Temperature Solar Collectors
- 4.3.1. Technology Development
- 4.3.2. Types of Solar Heating and DHW Systems
- 4.3.3. Sizing Installations

4.4. DHW or Air Conditioning Systems
- 4.4.1. Main Elements of the Facilities
- 4.4.2. Assembly and Maintenance
- 4.4.3. Calculation Methods and Control of Facilities

4.5. Medium Temperature Solar Thermal Systems
- 4.5.1. Types of Concentrators
- 4.5.2. The Cylindrical-Parabolic Collector
- 4.5.3. Solar Tracking System

4.6. Designing Solar Tracking Systems with Cylindrical-Parabolic Collectors
- 4.6.1. The Solar Field: Main Components of Cylindrical-Parabolic Collectors
- 4.6.2. Solar Field Sizing
- 4.6.3. The HTF System

4.7. Operation and Maintenance of Solar Systems with Cylindrical-Parabolic Collectors
- 4.7.1. Power Generation Process through the CCP
- 4.7.2. Solar Field Maintenance and Cleaning
- 4.7.3. Preventive and Corrective Maintenance

4.8. High-Temperature Solar Thermal Systems: Tower Plants
- 4.8.1. Designing a Tower Plant
- 4.8.2. Heliostat Field Sizing
- 4.8.3. Molten Salt Systems

4.9. Thermoelectric Generation
- 4.9.1. The Rankine Cycle
- 4.9.2. Theoretical Foundations of Turbine-Generators
- 4.9.3. Characterizing a Solar Thermal Power Plant

4.10. Other High Concentration Systems: Parabolic Disks and Solar Ovens
- 4.10.1. Types of Concentrators
- 4.10.2. Tracking Systems and Main Elements
- 4.10.3. Applications and Differences Compared to Other Technologies

Module 5. Wind Energy Systems

5.1. The Wind as a Natural Resource
- 5.1.1. Wind Behavior and Classification
- 5.1.2. The Wind Resource on our Planet
- 5.1.3. Wind Resource Measurements
- 5.1.4. Wind Power Prediction

5.2. Wind Power
- 5.2.1. Wind Power Evolution
- 5.2.2. Temporal and Spatial Variability of the Wind Resource
- 5.2.3. Wind Power Applications

5.3. Wind Turbines
- 5.3.1. Types of Wind Turbines
- 5.3.2. Parts of a Wind Turbine
- 5.3.3. Wind Turbine Functioning

5.4. Wind Generator
- 5.4.1. Asynchronous Generators: Wound Rotor
- 5.4.2. Asynchronous Generators: Squirrel Cage
- 5.4.3. Asynchronous Generators: Independent Excitation
- 5.4.4. Permanent Magnet Synchronous Generators

5.5. Site Selection
- 5.5.1. Basic Criteria
- 5.5.2. Specific Aspects
- 5.5.3. Onshore and Offshore Wind Power Facilities

5.6. Wind Farm Operation
- 5.6.1. Operating Model
- 5.6.2. Control Operations
- 5.6.3. Remote Operation

5.7. Wind Park Maintenance
- 5.7.1. Types of Maintenance: Corrective, Preventive and Predictive
- 5.7.2. Main Failures
- 5.7.3. Machine Improvement and Resource Organization
- 5.7.4. Maintenance Costs (OPEX)

5.8. Wind Power Impact and Environmental Maintenance
- 5.8.1. Impact on Flora and Erosion
- 5.8.2. Impact on Avifauna
- 5.8.3. Visual and Sound Impact
- 5.8.4. Environmental Maintenance

5.9. Data and Performance Analysis
- 5.9.1. Energy Production and Revenue
- 5.9.2. KPI Control Indicators
- 5.9.3. Wind Park Performance

5.10. Wind Park Design
- 5.10.1. Design Considerations
- 5.10.2. Wind Turbine Arrangement
- 5.10.3. Effect of the Trails on the Distance between Wind Turbines
- 5.10.4. Medium and High Voltage Equipment
- 5.10.5. Installation Costs (CAPEX)

Module 6. Grid-Connected and Off-Grid Photovoltaic Solar Energy Systems

6.1. Photovoltaic Solar Power Equipment and Environment
- 6.1.1. Fundamental Principles of Photovoltaic Solar Power
- 6.1.2. Situation in the Global Energy Sector
- 6.1.3. Main Components of Solar Facilities

6.2. Photovoltaic Generators: Operating Principles and Characterization
- 6.2.1. Solar Cell Operation
- 6.2.2. Design Rules: Characterizing the Module: Parameters
- 6.2.3. The I-V Curve
- 6.2.4. Module Technologies in Today's Market

6.3. Grouping Photovoltaic Modules
- 6.3.1. Photovoltaic Generator Design: Orientation and Inclination
- 6.3.2. Photovoltaic Generator Installation Structures
- 6.3.3. Solar Tracking System: Communication Environment

6.4. Energy Conversion: The Investor
- 6.4.1. Types of Investors
- 6.4.2. Characterization
- 6.4.3. Maximum Power Point Tracking (MPPT) and PV Inverter Performance Monitoring Systems

6.5. Transformer Station
- 6.5.1. Functioning and Parts of a Transformer Station
- 6.5.2. Sizing and Design Issues
- 6.5.3. The Market and Choosing Equipment

6.6. Other Systems of a Solar PV Plant
- 6.6.1. Supervision and Control
- 6.6.2. Security and Surveillance
- 6.6.3. Substation and HV

6.7. Grid-Connected Photovoltaic Systems
- 6.7.1. Design of Large-Scale Solar Parks: Prior Studies
- 6.7.2. Self-Consumption
- 6.7.3. Simulation Tools

6.8. Isolated Photovoltaic Systems
- 6.8.1. Elements of an Isolated Facility: Regulators and Solar Batteries
- 6.8.2. Uses: Pumping, Lighting, etc.
- 6.8.3. Solar Democratization

6.9. Operation and Maintenance of Photovoltaic Facilities
- 6.9.1. Maintenance Plans
- 6.9.2. Personnel and Equipment
- 6.9.3. Maintenance Management Software

6.10. New Lines of Improvement in Photovoltaic Parks
- 6.10.1. Distributed Generation
- 6.10.2. New Technologies and Trends
- 6.10.3. Automization

Module 7. Other Emerging Renewable Energies and Hydrogen as an Energy Carrier

7.1. Current Situation and Outlook
    7.1.1. Applicable Legislation
    7.1.2. Current Situation and Future Models
    7.1.3. Incentives and Financing
7.2. Energies of Marine Origin I: Tidal
    7.2.1. Tidal Power Origin and Potential
    7.2.2. Technologies for Harnessing Tidal Power
    7.2.3. Costs and Environmental Impact of Tidal Power
7.3. Energies of Marine Origin II: Undimotor
    7.3.1. Wave Power Origin and Potential
    7.3.2. Technologies for Harnessing Wave Power
    7.3.3. Costs and Environmental Impact of Wave Power
7.4. Energies of Marine Origin III: Maremothermal
    7.4.1. Maremothermal Power Origin and Potential
    7.4.2. Technologies for Harnessing Maremothermal Power
    7.4.3. Costs and Environmental Impact of Maremothermal Power
7.5. Geothermal Power
    7.5.1. Potential of Geothermal Power
    7.5.2. Technologies for Harnessing Geothermal Power
    7.5.3. Costs and Environmental Impact of Maremothermal Power
7.6. Applications of the Studied Technologies
    7.6.1. Applications
    7.6.2. Cost and Profitability Analysis
    7.6.3. Productive Diversification and Rural Development
    7.6.4. Advantages and Disadvantages
7.7. Hydrogen as an Energy Carrier
    7.7.1. Adsorption Process
    7.7.2. Heterogeneous Catalysis
    7.7.3. Hydrogen as an Energy Carrier

Module 8. Hybrid Systems and Storage

Module 9. Development, Financing and Feasibility of Renewable Energy Projects

9.1. Identifying Stakeholders
- 9.1.1. Developers, Engineering and Consulting Companies
- 9.1.2. Investment Funds, Banks and Other Stakeholders

9.2. Development of Renewable Energy Projects
- 9.2.1. Main Stages of Development
- 9.2.2. Main Technical Documentation
- 9.2.3. Sales Process: RTB

9.3. Renewable Energy Project Assessment
- 9.3.1. Technical Feasibility
- 9.3.2. Commercial Feasibility
- 9.3.3. Environmental and Social Feasibility
- 9.3.4. Legal Feasibility and Associated Risks

9.4. Financial Bases
- 9.4.1. Financial Knowledge
- 9.4.2. Analysis of Financial Statements
- 9.4.3. Financial Modeling

9.5. Economic Assessment of Renewable Energy Projects and Companies
- 9.5.1. Assessment Fundamentals
- 9.5.2. Assessment Methods
- 9.5.3. Calculating Project Profitability and Fundability

9.6. Financing of Renewable Energies
- 9.6.1. Characteristics of Project Finance
- 9.6.2. Structuring Financing
- 9.6.3. Risks in Financing

9.7. Renewable Asset Management: Asset Management
- 9.7.1. Technical Supervision
- 9.7.2. Financial Supervision
- 9.7.3. Claims, Permit Monitoring and Contract Management

9.8. Insurance in Renewable Energy Projects: Construction Phase
- 9.8.1. Developer and Builder. Specialized Insurance
- 9.8.2. Construction Insurance-CAR
- 9.8.3. Professional Insurance or CR Insurance
- 9.8.4. ALOP Clause - Advance Loss of Profit

9.9. Insurance in Renewable Energy Projects: Operation and Exploitation Phase
- 9.9.1. Property Insurance: Multirisk-OAR
- 9.9.2. O&M Contractor's CR or Professional Insurance
- 9.9.3. Suitable Coverage: Consequential and Environmental Losses

9.10. Damage Assessment and Appraisal in Renewable Energy Assets
- 9.10.1. Industrial Assessment and Appraisal Services: Renewable Energy Facilities
- 9.10.2. Intervention and Policy
- 9.10.3. Property Damages and Consequential Losses
- 9.10.4. Types of Claims: Photovoltaic, Solar Thermal, Hydroelectric and Wind Power

Module 10. Digital Transformation and Industry 4.0 Applied to Renewable Energy Systems

10.1. Current Situation and Outlook
- 10.1.1. Current Status of Technologies
- 10.1.2. Trend and Evolution
- 10.1.3. Challenges and Future Opportunities

10.2. Digital Transformation Applied to Renewable Energy Systems
- 10.2.1. The Era of Digital Transformation
- 10.2.2. The Digitization of Industry
- 10.2.3. 5G Technology

10.3. Automation and Connectivity: Industry 4.0
- 10.3.1. Automated Systems
- 10.3.2. Connectivity
- 10.3.3. The Importance of the Human Factor Key Factor

10.4. Lean Management 4.0
- 10.4.1. Lean Management 4.0
- 10.4.2. Benefits of Lean Management in Industry
- 10.4.3. Lean Tools in Renewable Energy Facility Management

10.5. Mass Collection Systems: IoT
- 10.5.1. Sensors and Actuators
- 10.5.2. Continuous Data Monitoring
- 10.5.3. Big Data
- 10.5.4. SCADA Systems

10.6. IoT Project Applied to Renewable Energies
- 10.6.1. Monitoring System Structure
- 10.6.2. IoT System Architecture
- 10.6.3. Cases Applied to IoT

10.7. Big Data and Renewable Energies
- 10.7.1. The Principles of Big Data
- 10.7.2. Big Data Tools
- 10.7.3. Usability in the Energy and REE Sector

10.8. Proactive or Predictive Maintenance
- 10.8.1. Predictive Maintenance and Fault Diagnosis
- 10.8.2. Instrumentation: Vibrations, Thermography, Damage Analysis and Diagnostic Techniques
- 10.8.3. Predictive Models

10.9. Drones and Automated Vehicles
- 10.9.1. Main Characteristics
- 10.9.2. Uses of Drones
- 10.9.3. Uses of Autonomous Vehicles

10.10. New Forms of Energy Commercialization: Blockchain and Smart Contracts
- 10.10.1. Information Systems Using Blockchain
- 10.10.2. Tokens and Smart Contacts
- 10.10.3. Present and Future Applications for the Electrical Sector
- 10.10.4. Available Platforms and Blockchain-Based Application Cases

Module 11. Energy in Building

11.1. Energy in Cities
- 11.1.1. City Energy Behavior
- 11.1.2. Sustainable Development Goals
- 11.1.3. ODS 11 - Sustainable Citizens and Communities

11.2. Less Consumption or Cleaner Energy
- 11.2.1. The Social Awareness of Clean Energies
- 11.2.2. Social Responsibility in Energy Usage
- 11.2.3. Greater Energy Need

11.3. Smart Cities and Buildings
- 11.3.1. Smart Buildings
- 11.3.2. Current Situation of Smart Buildings
- 11.3.3. Smart Building Examples

11.4. Energy Consumption
- 11.4.1. Building Energy Consumption
- 11.4.2. Measuring Energy Consumption
- 11.4.3. Knowing Our Consumption

11.5. Energy Demand
- 11.5.1. Building Energy Demand
- 11.5.2. Calculating Energy Demand
- 11.5.3. Managing Energy Demand

11.6. Efficient Usage of Energy
- 11.6.1. Responsibility in Energy Usage
- 11.6.2. Knowing Our Energy System

11.7. Energetic Livability
- 11.7.1. Energy Livability as a Key Aspect
- 11.7.2. Factors Affecting Building Energetic Livability

11.8. Thermal Comfort
- 11.8.1. The Importance of Thermal Comfort
- 11.8.2. The Need for Thermal Comfort

11.9. Energy Poverty
- 11.9.1. Energy Dependence
- 11.9.2. Current Situation

11.10. Solar Radiation: Climate Zones
- 11.10.1. Solar Radiation
- 11.10.2. Hourly Solar Radiation
- 11.10.3. Effects of Solar Radiation
- 11.10.4. Climate Zones
- 11.10.5. The Importance of the Geographic Location of a Building

Module 12. Standards and Regulations

12.1. Regulation
- 12.1.1. Justification
- 12.1.2. Key Notes
- 12.1.3. Responsible Agencies and Authorities

12.2. National and International Standards
- 12.2.1. ISO Standards
- 12.2.2. EN Standards
- 12.2.3. UNE Standards

12.3. Building Sustainability Certificates
- 12.3.1. The Need for Certificates
- 12.3.2. Certification Procedures
- 12.3.3. BREEAM, LEED, Green and WELL
- 12.3.4. Passivhaus

12.4. Standards
- 12.4.1. Industry Foundation Classes (IFC)
- 12.4.2. Building Information Model (BIM)

Module 13. Circular Economy

13.1. Circular Economy Tendency
- 13.1.1. Circular Economy Origin
- 13.1.2. Circular Economy Definition
- 13.1.3. Circular Economy Necessity
- 13.1.4. Circular Economy as Strategy

13.2. Circular Economy Features
- 13.2.1. First Principle: Preserve and Improve
- 13.2.2. Second Principle: Optimize
- 13.2.3. Third Principle: Promote
- 13.2.4. Key Features

13.3. Circular Economy Benefits
- 13.3.1. Economic Benefits
- 13.3.2. Social Benefits
- 13.3.3. Corporate Benefits
- 13.3.4. Environmental Benefits

13.4. Circular Economy Legislation
- 13.4.1. Regulations
- 13.4.2. European Directives

13.5. Life Cycle Analysis
- 13.5.1. Life Cycle Analysis Scope (ACV)
- 13.5.2. Stages
- 13.5.3. Reference Standards
- 13.5.4. Methodology
- 13.5.5. Tools

13.6. Carbon Footprint Calculation
- 13.6.1. Carbon Footprint
- 13.6.2. Types of Scope
- 13.6.3. Methodology
- 13.6.4. Tools
- 13.6.5. Carbon Footprint Calculation

13.7. CO2 Emission Reduction Plans
- 13.7.1. Improvement Plans: Supplies
- 13.7.2. Improvement Plans: Demand
- 13.7.3. Improvement Plans: Installations
- 13.7.4. Improvement Plans: Equipment
- 13.7.5. Emissions Offsetting

13.8. Carbon Footprint Records
- 13.8.1. Carbon Footprint Records
- 13.8.2. Requirements Prior to Registration
- 13.8.3. Documentation
- 13.8.4. Registration Request

13.9. Good Circular Practices
- 13.9.1. Methodology BIM
- 13.9.2. Selecting Material and Equipment
- 13.9.3. Maintenance
- 13.9.4. Waste Management
- 13.9.5. Reusing Material

Module 14. Energy Audits and Certification

14.1. Energy Audits
- 14.1.1. Energy Diagnostics
- 14.1.2. Energy Audits
- 14.1.3. ESE Energy Audits

14.2. Competencies of an Energy Auditor
- 14.2.1. Personal Attributes
- 14.2.2. Knowledge and Skills
- 14.2.3. Skill Acquisition, Maintenance and Improvement
- 14.2.4. Certifications
- 14.2.5. List of Energy Service Providers

14.3. Energy Audits in Building: UNE-EN 16247-2
- 14.3.1. Preliminary Contact
- 14.3.2. Fieldwork
- 14.3.3. Analysis
- 14.3.4. Report
- 14.3.5. Final Presentation

14.4. Auditing Measurement Tools
- 14.4.1. Network Analyzer and Clamp Ammeters
- 14.4.2. Luxmeter
- 14.4.3. Thermohygrometer
- 14.4.4. Anemometer
- 14.4.5. Combustion Analyzer
- 14.4.6. Thermographic Camera
- 14.4.7. Transmittance Meter

14.5. Investment Analysis
- 14.5.1. Preliminary Considerations
- 14.5.2. Noise Assessment Criteria
- 14.5.3. Cost Study
- 14.5.4. Grants and Subsidies
- 14.5.5. Payback Period
- 14.5.6. Optimal Profitability Level

14.6. Managing Contracts with Energy Services Companies
- 14.6.1. Energy Efficiency Services: UNE-EN 15900
- 14.6.2. First Service: Energy Management
- 14.6.3. Second Service: Maintenance
- 14.6.4. Third Service: Total Guarantee
- 14.6.5. Fourth Service: Facility Improvement and Renovation
- 14.6.6. Fifth Service: Savings and Renewable Energy Investments

14.7. Certification Programs: HULC
- 14.7.1. HULC Program
- 14.7.2. Data Prior to Calculation
- 14.7.3. Practical Case Example: Residencial Case
- 14.7.4. Practical Case Example: Small Tertiary Case
- 14.7.5. Practical Case Example: Large Tertiary Case

14.8. Certification Programs: CE3X
- 14.8.1. CE3X Program
- 14.8.2. Data Prior to Calculation
- 14.8.3. Practical Case Example: Residencial Case
- 14.8.4. Practical Case Example: Small Tertiary Case
- 14.8.5. Practical Case Example: Large Tertiary Case

14.9. Certification Programs: CERMA
- 14.9.1. CERMA Program
- 14.9.2. Data Prior to Calculation
- 14.9.3. Practical Case Example: New Constructions
- 14.9.4. Practical Case Example: Existing Buildings

14.10. Certification Programs: Others
- 14.10.1. Variety in Energy Calculation Programs Use
- 14.10.2. Other Certification Programs

Module 15. Bioclimatic Architecture

15.1. Materials Technology and Construction Systems
- 15.1.1. Bioclimatic Architecture Evolution
- 15.1.2. Most Used Materials
- 15.1.3. Construction Systems
- 15.1.4. Thermal Bridges

15.2. Enclosures, Walls and Roofs
- 15.2.1. The Role of Enclosures in Energy Efficiency
- 15.2.2. Vertical Enclosures and Materials Used
- 15.2.3. Horizontal Enclosures and Materials Used
- 15.2.4. Flat Roofs
- 15.2.5. Sloping Roofs

15.3. Openings, Glazing and Frames
- 15.3.1. Types of Openings
- 15.3.2. The Role of Openings in Energy Efficiency
- 15.3.3. Materials Used

15.4. Solar Protection
- 15.4.1. Need for Solar Protection
- 15.4.2. Solar Protection Systems
  - 15.4.2.1. Awnings
  - 15.4.2.2. Slats
  - 15.4.2.3. Overhangs
  - 15.4.2.4. Setbacks
  - 15.4.2.5. Other Protection Systems

15.5. Bioclimatic Strategy in Summer
- 15.5.1. The Importance of Utilizing Shade
- 15.5.2. Bioclimatic Construction Techniques for Summer
- 15.5.3. Good Building Practices

15.6. Bioclimatic Strategy for Winter
- 15.6.1. The Importance the Utilizing the Sun
- 15.6.2. Bioclimatic Construction Techniques for Winter
- 15.6.3. Construction Examples

15.7. Canadian Wells: Trombe Wall Vegetable Covers
- 15.7.1. Other Forms of Energy Utilization
- 15.7.2. Canadian Wells
- 15.7.3. Trombe Wall
- 15.7.4. Vegetable Covers

15.8. The Importance of Building Orientation
- 15.8.1. Wind Rose
- 15.8.2. Building Orientations
- 15.8.3. Examples of Bad Practices

15.9. Healthy Buildings
- 15.9.1. Air Quality
- 15.9.2. Lighting Quality
- 15.9.3. Thermal Insulation
- 15.9.4. Acoustic Insulation
- 15.9.5. Sick Building Syndrome

15.10. Bioclimatic Architecture Examples
- 15.10.1. International Architecture
- 15.10.2. Bioclimatic Architecture

Module 16. Renewable Energies in Building

16.1. Thermal Solar Power
- 16.1.1. Thermal Solar Power Scope
- 16.1.2. Thermal Solar Power Systems
- 16.1.3. Thermal Solar Power Today
- 16.1.4. Thermal Solar Power Use in Buildings
- 16.1.5. Advantages and Disadvantages

16.2. Photovoltaic Solar Power
- 16.2.1. Photovoltaic Solar Power Evolution
- 16.2.2. Photovoltaic Solar Power Today
- 16.2.3. Photovoltaic Solar Power Use in Buildings
- 16.2.4. Advantages and Disadvantages

16.3. Mini Hydraulic Power
 16.3.1. Hydraulic Power in Building
 16.3.2. Hydraulic Power and Mini Hydraulic Power Today
 16.3.3. Practical Applications of Hydraulic Power
 16.3.4. Advantages and Disadvantages
16.4. Mini Wind Power
 16.4.1. Wind and Mini Wind Power
 16.4.2. Update on Wind and Mini Wind Power
 16.4.3. Practical Applications of Wind Power
 16.4.4. Advantages and Disadvantages
16.5. Biomass
 16.5.1. Biomass as Renewable Fuel
 16.5.2. Types of Biomass Fuel
 16.5.3. Biomass Heat Production Systems
 16.5.4. Advantages and Disadvantages
16.6. Geothermal
 16.6.1. Geothermal Power
 16.6.2. Geothermal Power Systems Today
 16.6.3. Advantages and Disadvantages
16.7. Aerothermal Power
 16.7.1. Aerothermal Power in Building
 16.7.2. Aerothermal Power Systems Today
 16.7.3. Advantages and Disadvantages
16.8. Cogeneration Systems
 16.8.1. Cogeneration
 16.8.2. Cogeneration Systems in Homes and Buildings
 16.8.3. Advantages and Disadvantages
16.9. Biogas in Building
 16.9.1. Potentialities
 16.9.2. Biodigestors
 16.9.3. Integration
16.10. Self-Consumption
 16.10.1. Self-Consumption Application
 16.10.2. Self-Consumption Benefits
 16.10.3. The Sector Today
 16.10.4. Self-Consumption Power Systems in Buildings

Module 17. Electrical Installations

17.1. Electrical Equipment
 17.1.1. Classification
 17.1.2. Appliance Consumption
 17.1.3. Usage Profiles
17.2. Energy Labels
 17.2.1. Labeled Products
 17.2.2. Label Interpretation
 17.2.3. Ecolabels
 17.2.4. EPREL Database Product Registration
 17.2.5. Estimated Savings
17.3. Individual Measurement Systems
 17.3.1. Measuring Power Consumption
 17.3.2. Individual Meters
 17.3.3. Switchboard Meters
 17.3.4. Choosing Devices
17.4. Filters and Capacitor Banks
 17.4.1. Differences between Power Factor and Cosine of Phi
 17.4.2. Harmonics and Distortion Rate
 17.4.3. Reactive Energy Compensation
 17.4.4. Filter Selection
 17.4.5. Capacitor Bank Selection

17.5. Stand-By Consumption
   17.5.1. Stand-By Consumption
   17.5.2. Codes of Conduct
   17.5.3. Estimating Stand-By Consumption
   17.5.4. Anti Stand-By Devices
17.6. Electric Vehicle Recharging
   17.6.1. Types of Recharging Points
   17.6.2. Potential ITC-BT 52 Diagrams
   17.6.3. Provision of Regulatory Infrastructures in Buildings
   17.6.4. Horizontal Property and Installation of Recharging Points
17.7. Uninterruptible Power Supply (UPS) Systems
   17.7.1. UPS Infrastructure
   17.7.2. Types of UPS
   17.7.3. Features
   17.7.4. Applications
   17.7.5. UPS Selection
17.8. Electric Meter
   17.8.1. Types of Meters
   17.8.2. Digital Meter Operation
   17.8.3. Use as an Analyzer
   17.8.4. Telemetry and Data Mining
17.9. Electric Billing Optimization
   17.9.1. Electricity Tariffs
   17.9.2. Types of Low Voltage Consumers
   17.9.3. Types of Low Voltage Rates
   17.9.4. Power Term and Penalties
   17.9.5. Reactive Power Term and Penalties
17.10. Efficient Usage of Energy
   17.10.1. Energy Saving Habits
   17.10.2. Appliance Energy Saving
   17.10.3. Energy Culture in Facility Management

Module 18. Thermal Installations

18.1. Thermal Installations in Buildings
   18.1.1. Optimization of Thermal Installations in Buildings
   18.1.2. Thermal Machines Operation
   18.1.3. Pipe Insulation
   18.1.4. Duct Insulation
18.2. Gas Heat Production Systems
   18.2.1. Gas Heat Equipment
   18.2.2. Components of a Gas Production System
   18.2.3. Vacuum Test
   18.2.4. Good Practices in Gas Heat Systems
18.3. Diesel Heat Production Systems
   18.3.1. Diesel Heat Equipment
   18.3.2. Components of a Diesel Production System
   18.3.3. Good Practices in Diesel Heat Systems
18.4. Biomass Heat Production Systems
   18.4.1. Biomass Heat Equipment
   18.4.2. Components of a Biomass Heat Production System
   18.4.3. The Use of Biomass in the Home
   18.4.4. Good Practices in Biomass Production Systems
18.5. Heat Pumps
   18.5.1. Heat Pump Equipment
   18.5.2. Heat Pump Components
   18.5.3. Advantages and Disadvantages
   18.5.4. Good Practices in Heat Pump Equipment
18.6. Refrigerant Gases
   18.6.1. Knowledge of Refrigerant Gases
   18.6.2. Types of Refrigerant Gas Classification

18.7. Cooling Systems
- 18.7.1. Cooling Equipment
- 18.7.2. Common Installations
- 18.7.3. Other Cooling Systems
- 18.7.4. Refrigeration Component Overhaul and Cleaning

18.8. Heating, Ventilation and Air Conditioning HVAC Systems
- 18.8.1. Types of HVAC Systems
- 18.8.2. Home HVAC Systems
- 18.8.3. Correct Use of HVAC Systems

18.9. Domestic Hot Water Systems DHW
- 18.9.1. Types of DHW Systems
- 18.9.2. Home DHW Systems
- 18.9.3. Correct Use of DHW Systems

18.10. Thermal Installation Maintenance
- 18.10.1. Boiler and Burner Maintenance
- 18.10.2. Auxiliary Components Maintenance
- 18.10.3. Refrigerant Gas Leak Detection
- 18.10.4. Refrigerant Gas Recovery

Module 19. Lighting Installations

19.1. Light Sources
- 19.1.1. Lighting Technology
  - 19.1.1.1. Properties of Light
  - 19.1.1.2. Photometry
  - 19.1.1.3. Photometric Measurements
  - 19.1.1.4. Lighting
  - 19.1.1.5. Auxiliary Electrical Equipment
- 19.1.2. Traditional Light Sources
  - 19.1.2.1. Incandescent and Halogen Lamps
  - 19.1.2.2. High- and Low-Pressure Sodium Steam
  - 19.1.2.3. High- and Low-Pressure Mercury Steam
  - 19.1.2.4. Other Technologies: Induction, Xenon

19.2. LED Technology
- 19.2.1. Operating Principle
- 19.2.2. Electrical Properties
- 19.2.3. Advantages and Disadvantages
- 19.2.4. LED Lighting: Optics
- 19.2.5. Auxiliary Equipment: Driver

19.3. Indoor Lighting Requirements
- 19.3.1. Standards and Regulations
- 19.3.2. Lighting Projects
- 19.3.3. Quality Criteria

19.4. Outdoor Lighting Requirements
- 19.4.1. Standards and Regulations
- 19.4.2. Lighting Projects
- 19.4.3. Quality Criteria

19.5. Lighting Calculation Software: DIALux
- 19.5.1. Features
- 19.5.2. Menus
- 19.5.3. Project Design
- 19.5.4. Obtaining and Interpreting Results

19.6. Lighting Calculation Software: EVO
- 19.6.1. Features
- 19.6.2. Advantages and Disadvantages
- 19.6.3. Menus
- 19.6.4. Project Design
- 19.6.5. Obtaining and Interpreting Results

19.7. Lighting Energy Efficiency
- 19.7.1. Standards and Regulations
- 19.7.2. Energy Efficiency Improvement Measures
- 19.7.3. Integrating Natural Light

19.8. Biodynamic Lighting
- 19.8.1. Light Pollution
- 19.8.2. Circadian Rhythms
- 19.8.3. Harmful Effects

19.9. Indoor Lighting Project Calculation
- 19.9.1. Residential Buildings
- 19.9.2. Corporate Buildings
- 19.9.3. Schools and Education Centers
- 19.9.4. Hospital Centers
- 19.9.5. Public Buildings
- 19.9.6. Industries
- 19.9.7. Commercial and Exhibition Spaces

19.10. Outdoor Lighting Project Calculation
- 19.10.1. Street and Road Lighting
- 19.10.2. Facades
- 19.10.3. Signs and Illuminated Signs

Module 20. Control Installations

20.1. Home Automation
- 20.1.1. State of the Art
- 20.1.2. Standards and Regulations
- 20.1.3. Equipment
- 20.1.4. Services
- 20.1.5. Networks

20.2. Building Automation
- 20.2.1. Characteristics and Regulation
- 20.2.2. Building Automation and Control Systems and Technologies
- 20.2.3. Building Energy Efficiency Technical Management

20.3. Teleprocessing
- 20.3.1. Determining the System
- 20.3.2. Key Elements
- 20.3.3. Monitoring Software

20.4. Smart Homes
- 20.4.1. Features
- 20.4.2. Equipment

20.5. The Internet of Things: IoT
- 20.5.1. Technological Monitoring
- 20.5.2. Standards
- 20.5.3. Equipment
- 20.5.4. Services
- 20.5.5. Networks

20.6. Telecommunication Installations
- 20.6.1. Key Infrastructure
- 20.6.2. Television
- 20.6.3. Radio
- 20.6.4. Telephony

20.7. KNX and DALI Protocols
- 20.7.1. Standardization
- 20.7.2. Applications
- 20.7.3. Equipment
- 20.7.4. Design and Configuration

20.8. IP Networks WiFi
- 20.8.1. Standards
- 20.8.2. Features
- 20.8.3. Design and Configuration

20.9. Bluetooth
- 20.9.1. Standards
- 20.9.2. Design and Configuration
- 20.9.3. Features

20.10. Future Technology
- 20.10.1. Zigbee
- 20.10.2. Programming and Configuration Python
- 20.10.3. Big Data

A comprehensive specialization program that will take you through the necessary training to compete with the best in your profession"

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

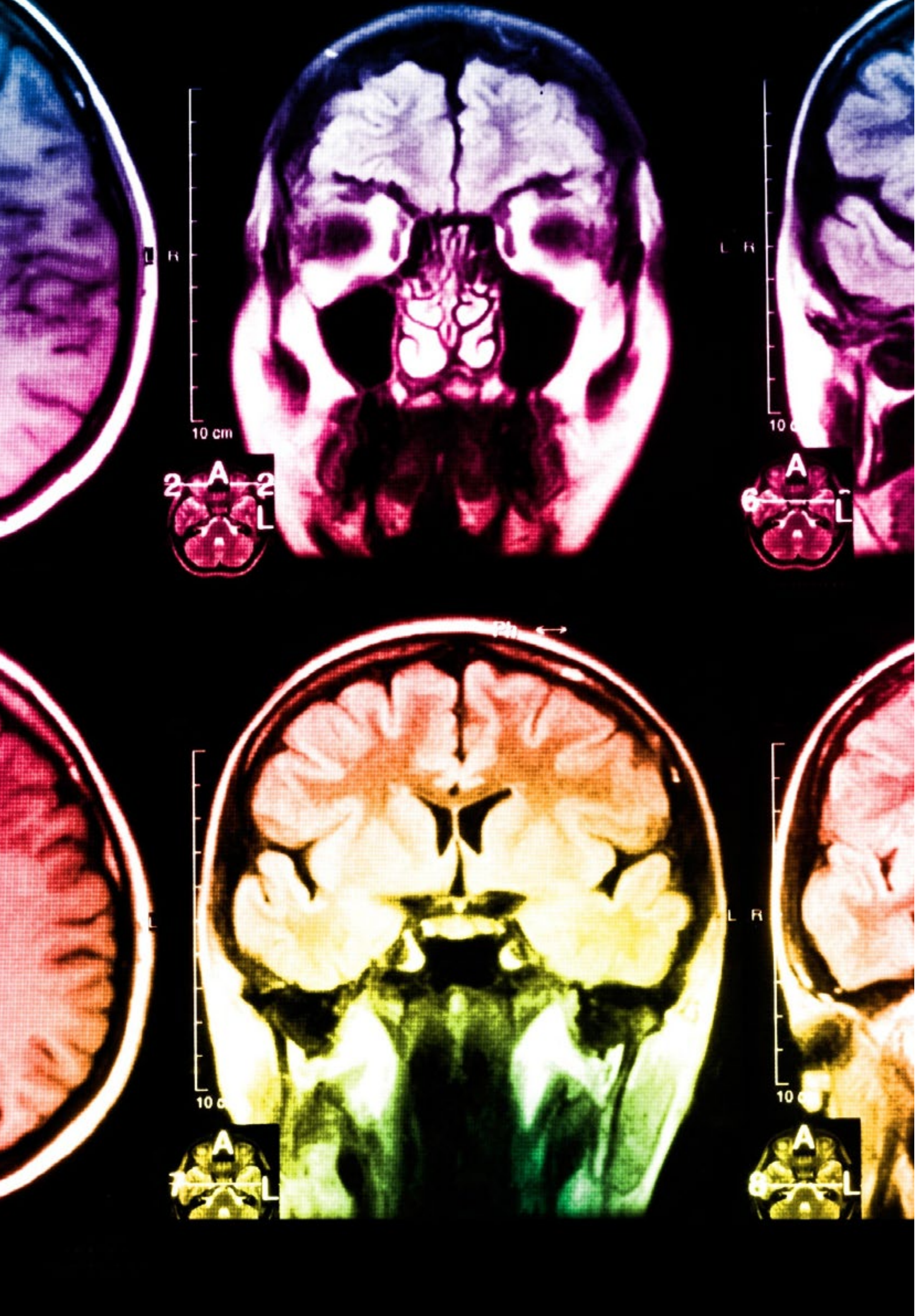
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

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 relearn). 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 elearning, 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.

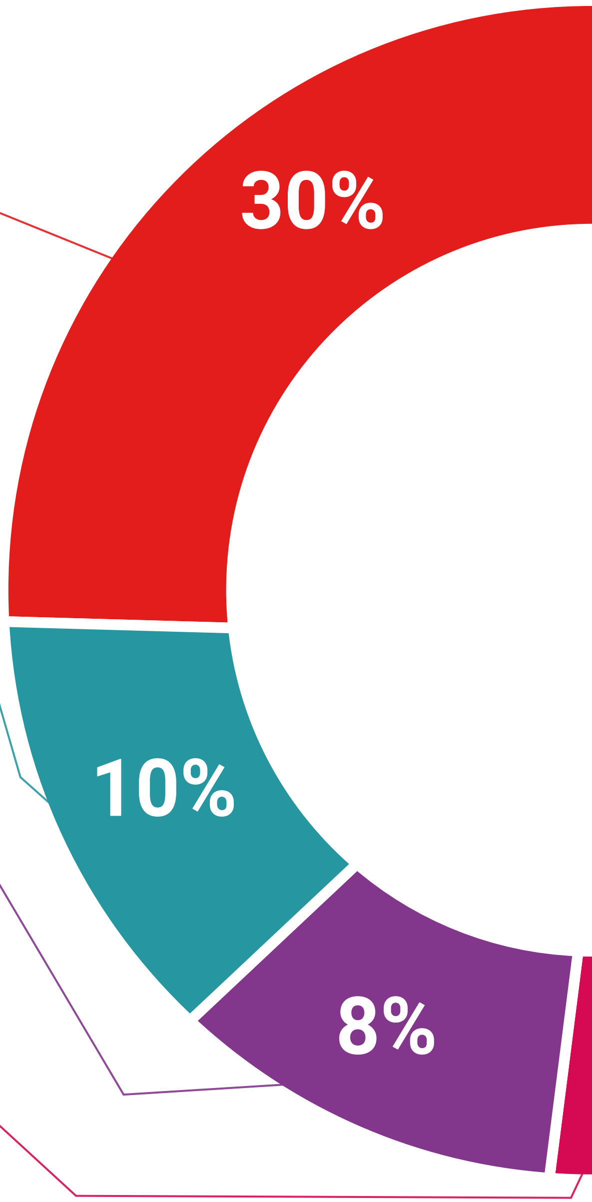
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

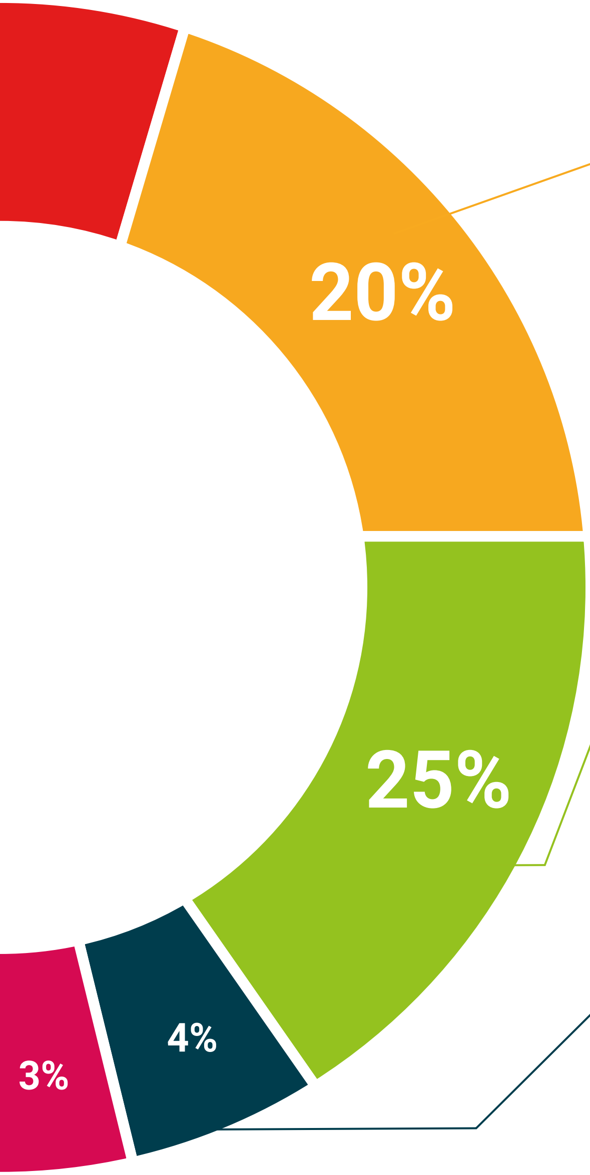
Practising Skills and Abilities

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

This Advanced Master's Degree in Renewable Energies and Sustainability in Building guarantees you, in addition to the most rigorous and updated training, access to a Advanced Master's Degree issued by TECH Technological University.

Successfully complete this program and receive your university degree without travel or laborious paperwork"

This **Advanced Master's Degree in Renewable Energies and Sustainability in Building** contains the most complete and up-to-date program on the market.

After the student has passed the assessments, they will receive their corresponding **Advanced Master's Degree** issued by **TECH Technological University** via tracked delivery*.

The diploma issued by **TECH Technological University** will reflect the qualification obtained in the Advanced Master's Degree, and meets the requirements commonly demanded by labor exchanges, competitive examinations, and professional career evaluation committees.

Title: **Advanced Master's Degree in Renewable Energies and Sustainability in Building**

Official N° of hours: **3,000 h.**

tech technological university

Awards the following

DIPLOMA

to

Mr./Ms. _______________, with identification number ___________.

For having successfully passed and accredited the following program

ADVANCED MASTER'S DEGREE

in

Renewable Energies and Sustainability in Building

This is a qualification awarded by this University, equivalent to 3,000 hours, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH is a Private Institution of Higher Education recognized by the Ministry of Public Education as of June 28, 2018.

June 17, 2020

Tere Guevara Navarro
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

Advanced Master's Degree in Renewable Energies and Sustainability in Building

General Structure of the Syllabus

Year	Subject	Hours	Type
1º	Renewable Energies and Their Current Environment	150	CO
1º	Hydraulic Energy Systems	150	CO
1º	Biomass and Biofuel Energy Systems	150	CO
1º	Solar Thermal Energy Systems	150	CO
1º	Wind Energy Systems	150	CO
1º	Grid-Connected and Off-Grid Photovoltaic Solar Energy Systems	150	CO
1º	Other Emerging Renewable Energies and Hydrogen as an Energy Carrier	150	CO
1º	Hybrid Systems and Storage	150	CO
1º	Development, Financing and Feasibility of Renewable Energy Projects	150	CO

Year	Subject	Hours	Type
2º	Digital Transformation and Industry 4.0 Applied to Renewable Energy Systems	150	CO
2º	Energy in Building	150	CO
2º	Standards and Regulations	150	CO
2º	Circular Economy	150	CO
2º	Energy Audits and Certification	150	CO
2º	Bioclimatic Architecture	150	CO
2º	Renewable Energies in Building	150	CO
2º	Electrical Installations	150	CO
2º	Thermal Installations	150	CO
2º	Lighting Installations	150	CO
2º	Control Installations	150	CO

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

Advanced Master's Degree
Renewable Energies and Sustainability in Building

- Modality: **online**
- Duration: **2 years**
- Certificate: **TECH Technological University**
- Dedication: **16h/week**
- Schedule: **at your own pace**
- Exams: **online**

Advanced Master's Degree
Renewable Energies and Sustainability in Building

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