Postgraduate Diploma
Production and Generation of Conventional Electricity

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Postgraduate Diploma

Production and Generation of Conventional Electricity

- Modality: **online**
- Duration: **6 months**
- Certificate: **TECH Technological University**
- Dedication: **16h/week**
- Schedule: **at your own pace**
- Exams: **online**

Website: **www.techtitute.com/in/engineering/postgraduate-diploma/postgraduate-diploma-production-generation-conventional-electricity**

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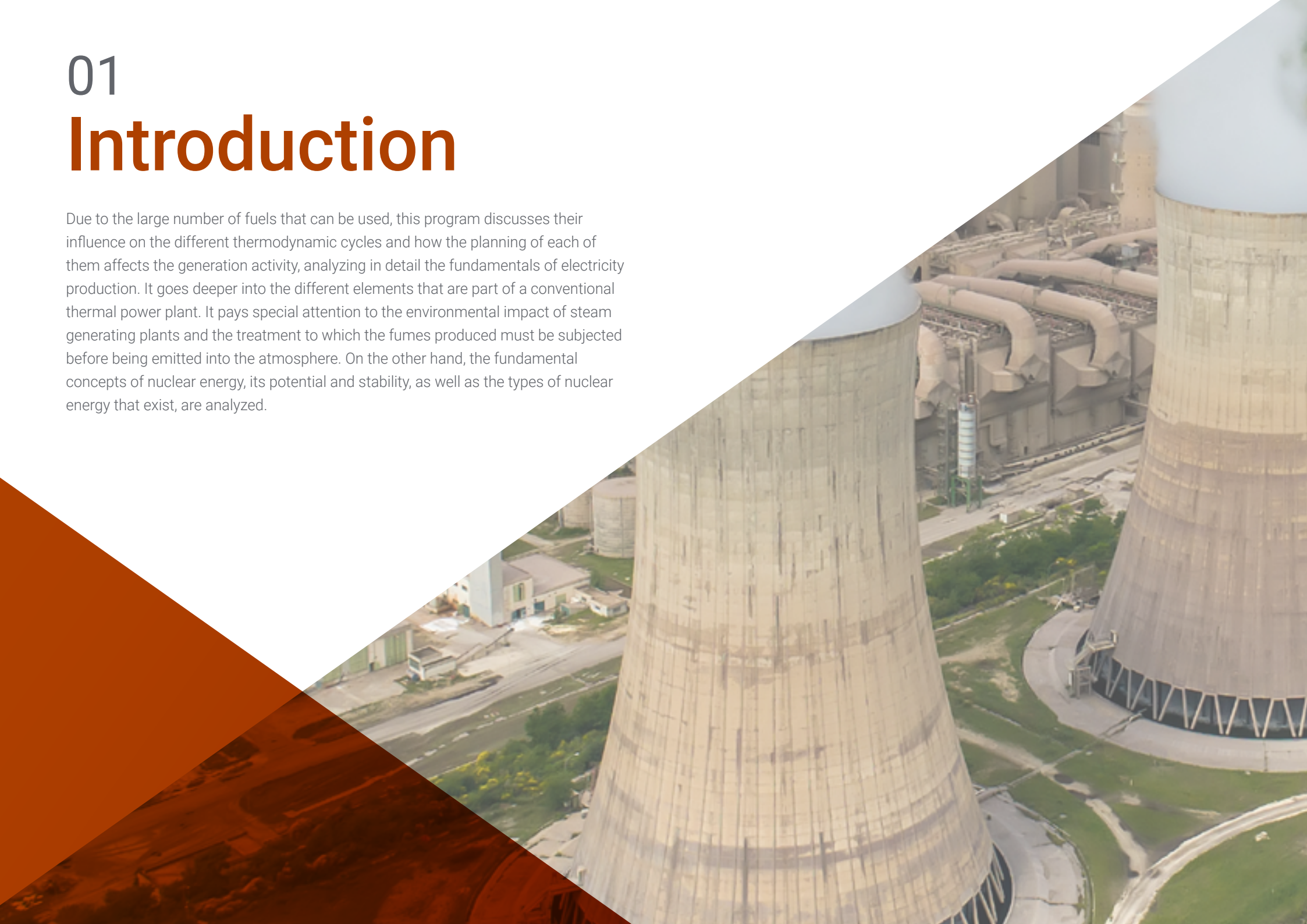
01

Introduction

Due to the large number of fuels that can be used, this program discusses their influence on the different thermodynamic cycles and how the planning of each of them affects the generation activity, analyzing in detail the fundamentals of electricity production. It goes deeper into the different elements that are part of a conventional thermal power plant. It pays special attention to the environmental impact of steam generating plants and the treatment to which the fumes produced must be subjected before being emitted into the atmosphere. On the other hand, the fundamental concepts of nuclear energy, its potential and stability, as well as the types of nuclear energy that exist, are analyzed.



It masters all aspects of conventional and generation of electricity and delves into the safety of its facilities and the operation of associated components, such as nuclear reactors"

This program in Production and Generation of Conventional Electricity will cover the characteristics of conventional energy sources and how they influence the different processes that can be used to optimize the generation of electricity, breaking down the operation of steam generators or nuclear reactants.

Since steam generators are dangerous machines, it is considered how to operate them safely and the different types of control to which they are subjected, as well as the components used to perform them. In turn, it proposes a detailed approach to the characteristics of water and the physicochemical procedure to which it must be subjected in order to obtain a quality steam in the production process, together with the negative effects that poor water treatment can have. It addresses the requirements to be met by steam generators and the demands to which manufacturers, boilers, users and operators are subject. New trends in conventional power plants are also considered by studying biomass plants, urban waste and geothermal energy.

In addition, as it is a 100% online Postgraduate Diploma it provides the student with the ease of being able to take it comfortably, wherever and whenever they want. All you need is a device with internet access to take your career one step further. A modality in line with the current times with all the guarantees to position the professional in a highly demanded area in continuous change, in line with the SDGs promoted by the UN.

This **Postgraduate Diploma in Production and Generation of Conventional Electricity** contains the most complete and up-to-date scientific program on the market. The most important features of the program include:

- The development of case studies presented by experts in electrical engineering
- The deepening in Energy Resources Management
- The graphic, schematic, and eminently practical contents with which they are created, provide scientific and 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

You will discover the potential of small modular reactors (SMRs) for electricity generation, their advantages and disadvantages, and the types that exist"

Address the analysis and study of the thermodynamic processes that occur during the operation of industrial power generation processes with success thanks to TECH"

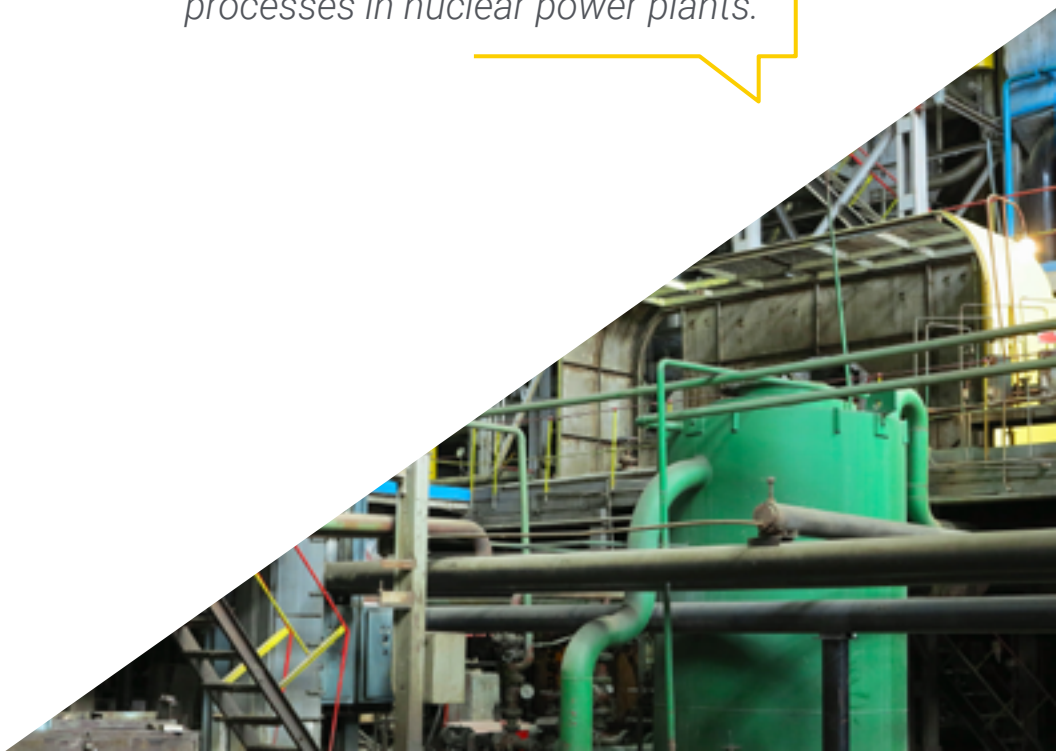
You will learn how to correctly size the fume treatment and purification system to minimize environmental impact and comply with new environmental regulations and legislation.

Thanks to this program you will learn how to optimize the performance of thermodynamic processes in nuclear power plants.

The program's teaching staff includes professionals from the sector who contribute their work experience to this training 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 an immersive training program designed to train in 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 academic year. For this purpose, the professional will be assisted by an innovative interactive video system created by renowned and experienced experts.



02

Objectives

The Postgraduate Diploma in Production and Generation of Conventional Electricity is aimed at the student acquiring the necessary skills to undertake various functions oriented to the generation of electricity with conventional energy, entering into its uses and operation to successfully train them to the management and maintenance of the associated energy production plants. In this way, we propose a specific and complete syllabus with quality content that, together with the guidance of experts, will enable the professional to achieve the following objectives.

The content of this Postgraduate Diploma will guide you to correctly interpret the concepts of energy and heat involved in the production of electrical energy, together with the different fuels involved in the process"

General Objectives

- Interpret the investments and feasibility of power generation plants
- Discover the potential business opportunities offered by electricity generation infrastructures
- Delve into the latest trends, technologies and techniques in electric power generation
- Identify the components necessary for the correct functionality and operation of the facilities that make up the power generation plants
- Establish preventive maintenance plans that ensure and guarantee the proper operation of the power plants, taking into account human and material resources, the environment and the most rigorous quality standards
- Successfully manage maintenance plans for power generation plants
- Analyze the different productivity techniques existing in power generation plants, taking into account the particular characteristics of each facility
- Select the most appropriate contracting model according to the characteristics of the power plant to be built

In this program you will learn in detail the treatment associated with the waste produced in nuclear power plants, together with the decommissioning and dismantling of a nuclear power plant"

Specific Objectives

Module 1: Industrial Boilers for Electric Power Generation and Production

- Interpret the concepts of energy and heat involved in the production of electrical energy, together with the different fuels involved in the process
- Address the analysis and study of the thermodynamic processes that occur during the operation of industrial processes for the generation of electrical energy
- Break down the components and equipment that make up the steam generators used in the production of electrical energy
- Acquire knowledge of the operation of the systems that are part of steam generators
- Analyze the operating procedures of steam generators for safe functionality
- Correctly manage the different controls to which steam generators used for electric power generation must be subjected

Module 2: Conventional Thermal Plants

- Interpret the production process of conventional thermal power plants together with the different systems involved
- Addressing start-up and planned shutdowns in this type of power plant
- Know in detail the composition of power generation equipment and its auxiliary systems
- Acquire the necessary knowledge to optimize the operation of turbogenerators, turbines and auxiliary systems that are part of the power generation process in a conventional power plant
- You will correctly manage the physical-chemical treatment of water to be converted into steam for energy production, together with the failures that occur due to poor treatment
- Correct sizing of the flue gas treatment and purification system to minimize the environmental impact of this type of power plant and comply with new environmental regulations and legislation
- Prepare documentation related to the safety and design of steam generators in conventional thermal power plants
- Analyze alternatives to traditional fuels and the modifications to be made to a conventional plant to adapt it to renewable fuels

Module 3: Nuclear Power Plants

- Analyze the fundamentals of nuclear energy and its potential for energy generation today
- Evaluate the parameters involved in nuclear reactions
- Identify the components, equipment and functionality of the systems of a nuclear power plant
- Deepen in the operation of the different types of reactors currently operating in nuclear power plants
- Optimize the performance of thermodynamic processes in nuclear power plants
- Establish operational and operating guidelines for safety in this type of plants
- Know in detail the treatment associated with the waste produced in nuclear power plants, together with the decommissioning and decommissioning of a nuclear power plant
- Deepen knowledge of the evolution of nuclear power plants and the new generation of power plants to be built in the near future
- Evaluate the potential of SMR small modular reactors

03

Course Management

In its maxim of offering an elite education for all, TECH relies on renowned professionals so that the student acquires a solid knowledge in the production and generation of conventional electrical energy. Therefore, this program has a highly qualified teacher with extensive experience in the sector, whose trajectory has positioned him as a great manager within the sector. In this way, it will offer the best tools to the student in the development of their skills during the course, with the guarantees required to specialize in a sector in full update and innovation, so it will reflect on the different energy sources with accuracy and precision.

Acquire the skills you need within the energy industry thanks to the expert faculty you have in this program, take advantage of the opportunity!"

Management

Mr. Palomino Bustos, Raúl

- Director at the Institute for Technical Training and Innovation
- International Consultant in Engineering, Construction and Maintenance of Energy Production Plants for the company RENOVETEC
- Technological/training expert recognized and accredited by the State Public Employment Service
- Industrial Engineer, University of Carlos III in Madrid
- Industrial Technical Engineer by the EUITI of Toledo
- Master's Degree in Occupational Risk Prevention from the Francisco de Vitoria University
- Master's Degree in Quality and Environment by the Spanish Quality Association

04

Structure and Content

The structure of the contents of this program has been designed by industrial engineering professionals focused on the production and generation of conventional electric power. The program comprises three blocks dedicated to industrial boilers, thermal power plants and nuclear power plants, and analyzes all their pros and cons in the 21st century. Therefore, this curriculum is essential to move towards a more sustainable industry, covering all the knowledge that professionals need to be competent in their day-to-day work in this sector.

You will learn about the different conventional power generating systems, analyze their functions and get to know their fundamental principles in depth"

Module 1. Industrial Boilers for Electric Power Generation and Production

1.1. Energy and Heat
- 1.1.1. Fuels
- 1.1.2. Energy
- 1.1.3. Thermal Power Generation Process

1.2. Steam Power Cycles
- 1.2.1. Carnot Power Cycle
- 1.2.2. Simple *Rankine* Cycle
- 1.2.3. *Rankine* Cycle with Superheating
- 1.2.4. Effects of Pressure and Temperature on the *Rankine* Cycle
- 1.2.5. Ideal Cycle Vs Real Cycle
- 1.2.6. Ideal *Rankine* Cycle with Superheating

1.3. Steam Thermodynamics
- 1.3.1. Steam
- 1.3.2. Types of Steam
- 1.3.3. Thermodynamic Processes

1.4. Steam Generator
- 1.4.1. Functional Analysis
- 1.4.2. Parts of a Steam Generator
- 1.4.3. Equipment of a Steam Generator

1.5. Water-Tube Boilers for Power Generation
- 1.5.1. Natural Circulation
- 1.5.2. Forced Circulation
- 1.5.3. Water-Steam Circuit

1.6. Systems of the Steam Generator I
- 1.6.1. Fuel System
- 1.6.2. Air Combustion System
- 1.6.3. Water Treatment System

1.7. Systems of the Steam Generator II
- 1.7.1. Water Preheating System
- 1.7.2. Gas Combustion System
- 1.7.3. Blower Systems

1.8. Safety in Steam Generator Operation
- 1.8.1. Safety Standards
- 1.8.2. BMS for Steam Generators
- 1.8.3. Functional Requirements

1.9. Control System
- 1.9.1. Fundamental Principles
- 1.9.2. Control Mode
- 1.9.3. Basic Operations

1.10. The Control of a Steam Generator
- 1.10.1. Basic Controls
- 1.10.2. Combustion Control
- 1.10.3. Other Variables to Control

Module 2. Conventional Thermal Plants

2.1. Process in Conventional Thermal Power Plants
- 2.1.1. Steam Generator
- 2.1.2. Steam Turbines
- 2.1.3. Condensing System
- 2.1.4. Feed Water System

2.2. Start-up and Shutdown
- 2.2.1. Start-up Process
- 2.2.2. Turbine Wheel
- 2.2.3. Synchronization of the Unit
- 2.2.4. Unit Charging Socket
- 2.2.5. Stop

2.3. Power Generation Equipment
- 2.3.1. Electric Turbogenerator
- 2.3.2. Steam Turbines
- 2.3.3. Parts of a Turbine
- 2.3.4. Auxiliary System of the Turbine
- 2.3.5. Lubrication and Control System

2.4. Electric Generator
- 2.4.1. Synchronous Generator
- 2.4.2. Parts of the Synchronous Generator
- 2.4.3. Generator Excitation
- 2.4.4. Voltage Regulator
- 2.4.5. Generator Cooling
- 2.4.6. Generator Protections

2.5. Water Treatment
- 2.5.1. Water for Steam Generation
- 2.5.2. External Water Treatment
- 2.5.3. Internal Water Treatment
- 2.5.4. Effects of Fouling
- 2.5.5. Corrosion Effects

2.6. Efficiency
- 2.6.1. Mass and Energy Balance
- 2.6.2. Combustion
- 2.6.3. Efficiency of the Steam Generator
- 2.6.4. Heat Loss

2.7. Environmental Impact
- 2.7.1. Environmental Protection
- 2.7.2. Environmental Impact of Thermal Power Plants
- 2.7.3. Sustainable Development
- 2.7.4. Smoke Treatment

2.8. Conformity Assessment
- 2.8.1. Requirements
- 2.8.2. Manufacturer Requirements
- 2.8.3. Boiler Requirements
- 2.8.4. User Requirements
- 2.8.5. Operator Requirements

2.9. Security/Safety
- 2.9.1. Fundamental Principles
- 2.9.2. Design
- 2.9.3. Fabrication
- 2.9.4. Materials

2.10. New Trends in Conventional Power Plants
- 2.10.1. Biomass
- 2.10.2. Wate
- 2.10.3. Geothermal

Module 3. Nuclear Power Plants

3.1. Theoretical Basis
- 3.1.1. Fundamentals
- 3.1.2. Binding Energy
- 3.1.3. Nuclear Stability

3.2. Nuclear Reaction
- 3.2.1. Fission
- 3.2.2. Fusion
- 3.2.3. Other Reactions

3.3. Components of a Nuclear Reactor
- 3.3.1. Fuels
- 3.3.2. Moderator
- 3.3.3. Biological Barrier
- 3.3.4. Control Barriers
- 3.3.5. Reflector
- 3.3.6. Reactor Shell
- 3.3.7. Coolant

3.4. Most Common Types of Reactors
- 3.4.1. Types of Reactors
- 3.4.2. Pressurized Water Reactor
- 3.4.3. Boiling Water Reactor

3.5. Other Types of Reactors
- 3.5.1. Heavy Water Reactors
- 3.5.2. Gas-Cooled Reactor
- 3.5.3. Channel Type Reactor
- 3.5.4. Fast Breeder Reactor

3.6. *Rankine* Cycle in Nuclear Power Plants
- 3.6.1. Differences between Thermal and Nuclear Power Plant Cycles
- 3.6.2. *Rankine* Cycle in boiling Water Power Plants
- 3.6.3. *Rankine* Cycle in Heavy Water Power Plants
- 3.6.4. *Rankine* Cycle in Pressurized Water Power Plants

3.7. Nuclear Power Plant Safety
- 3.7.1. Safety in Design and Construction
- 3.7.2. Safety by Means of Barriers against the Release of Fission Products
- 3.7.3. Security through Systems
- 3.7.4. Redundancy, Single Fault and Physical Separation Criteria
- 3.7.5. Operation Safety

3.8. Radioactive Waste, Dismantling and Decommissioning of Facilities
- 3.8.1. Radioactive Waste
- 3.8.2. Dismantling
- 3.8.3. Closing

3.9. Future Tendencies Generation IV
- 3.9.1. Gas- Quickly Cooled Reactor
- 3.9.2. Lead-Cooled Fast Reactor
- 3.9.3. Molten Salt Fast Reactor
- 3.9.4. Water-Cooled Supercritical Water Reactor
- 3.9.5. Sodium-Cooled Fast Reactor
- 3.9.6. Very High Temperature Reactor
- 3.9.7. Evaluation Methodology
- 3.9.8. Risk of Explosion Evaluation

3.10. Small Modular Reactors SMR
- 3.10.1. SMR
- 3.10.2. Advantages and Disadvantages.
- 3.10.3. Types of SMR

With this TECH specialization you will stand out professionally, boosting your career path towards excellence in the energy sector"

05

Methodology

This training program offers 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"

At TECH we use the Case Method

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

At TECH, you will experience a way of learning that is shaking the foundations of traditional universities around the world"

We are the first online university to combine Harvard Business School case studies with a 100% online learning system based on repetition.

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

A learning method that is different and innovative.

This intensive Engineering program at TECH Technological University prepares you to face all the challenges in this field, both nationally and internationally. We are committed to promoting your personal and professional growth, the best way to strive for success, that is why at TECH Technological University you will use Harvard case studies, with which we have a strategic agreement that allows us, to offer you material from the best university in the world.

> *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 by 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

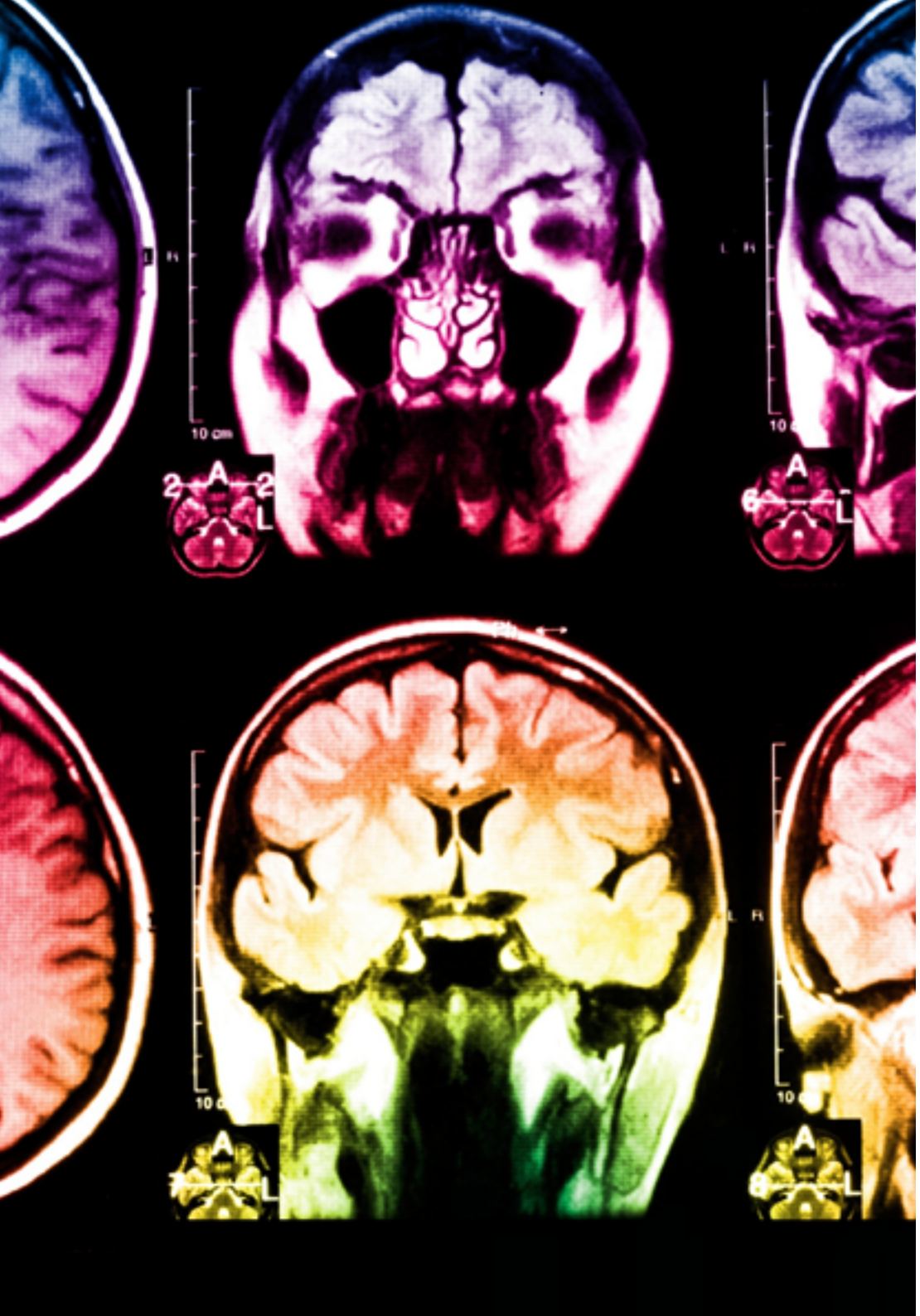
TECH is the first university in the world to combine Harvard University case studies with a 100% online learning system based on repetition, which combines 8 different didactic elements in each lesson.

We enhance Harvard case studies 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 university 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

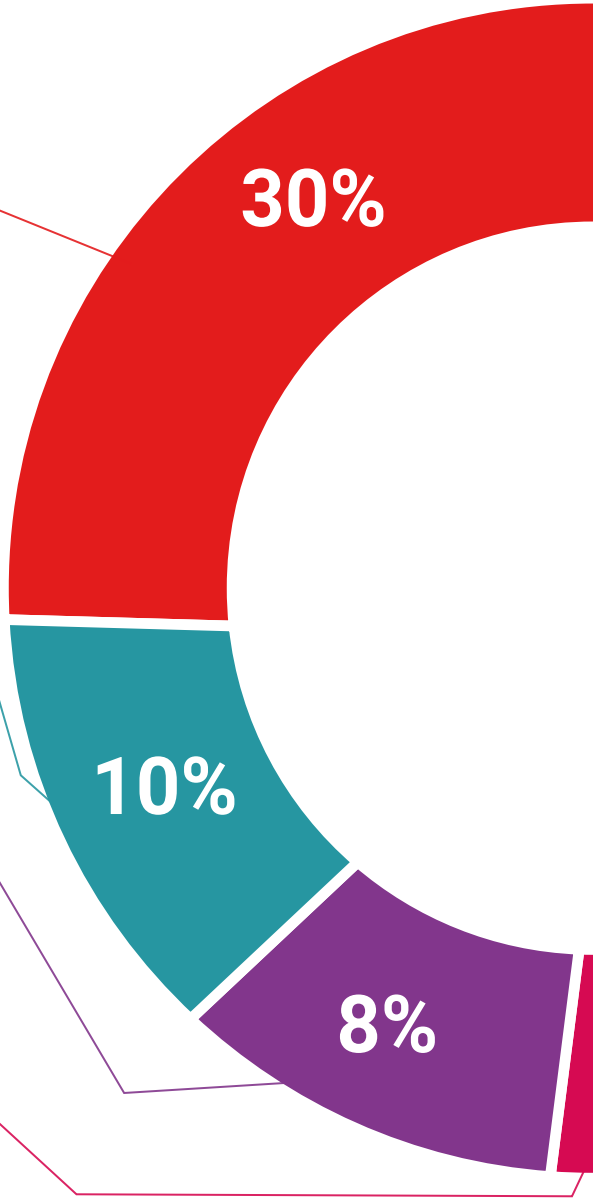
There is scientific evidence suggesting that observing third-party experts can be useful. Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

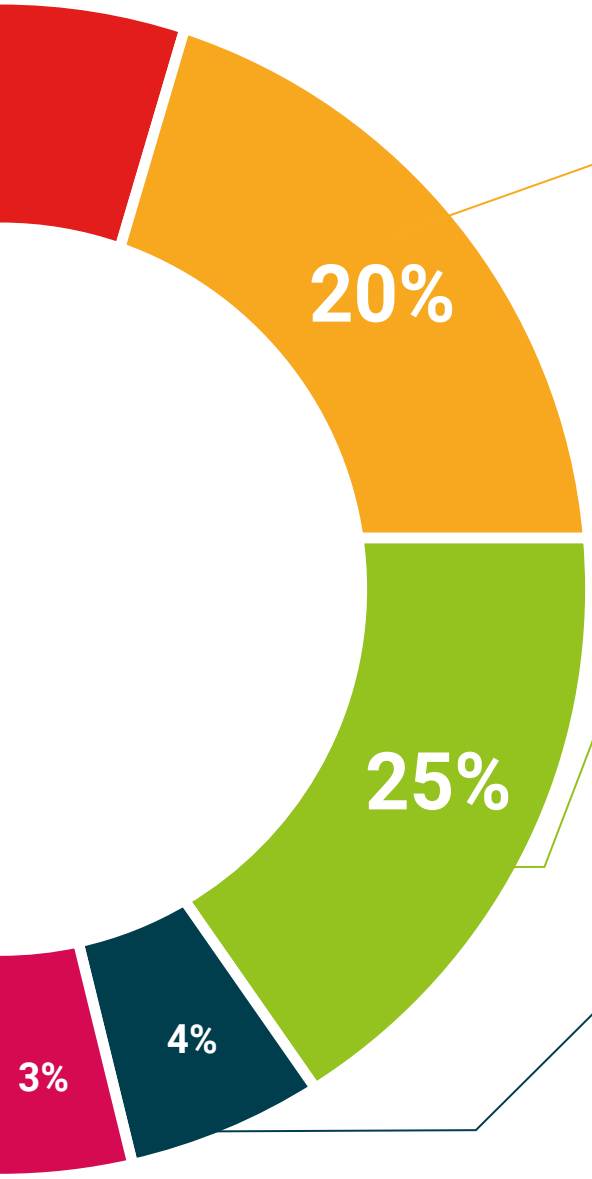
Practising Skills and Abilities

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

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

They will complete a selection of the best case studies in the field used at Harvard. Cases that are presented, analyzed, and supervised by the best senior management 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 multimedia content presentation training Exclusive system 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 your goals.

06

Certificate

The Postgraduate Diploma in Production and Generation of Conventional Electricity, in addition to the most rigorous and up-to-date training, access to a Postgraduate Diploma issued by TECH Technological University.

Successfully complete this training program and receive your certificate without travel or laborious paperwork"

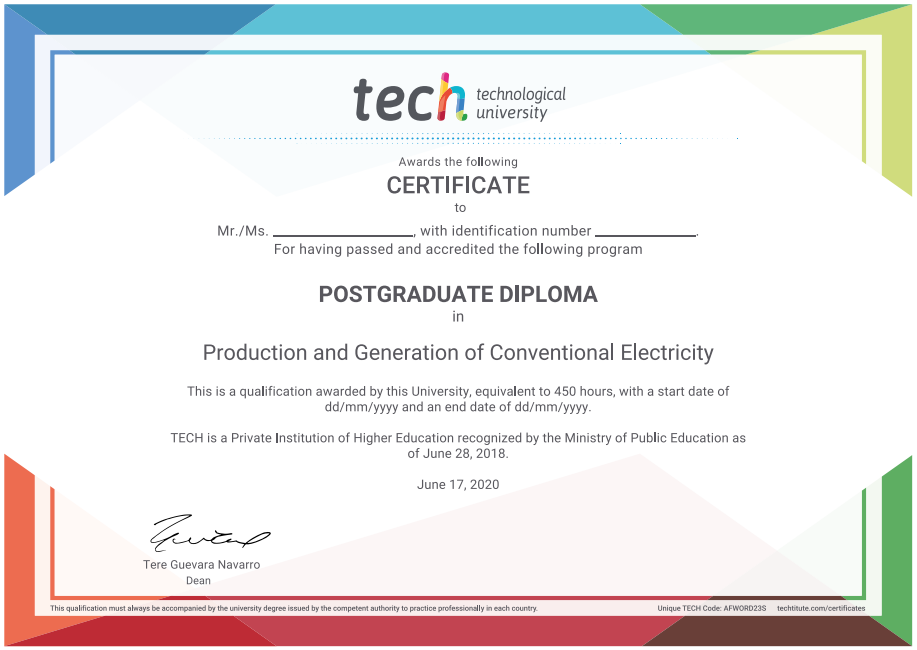
This **Postgraduate Diploma in Production and Generation of Conventional Electricity** contains the most complete and up-to-date scientific program on the market

After the student has passed the assessments, they will receive their corresponding Postgraduate Diploma issued by **TECH Technological University** via tracked delivery*.

The certificate issued by **TECH Technological University** will reflect the qualification obtained in the Postgraduate Diploma, and meets the requirements commonly demanded by labor exchanges, competitive examinations, and professional from career evaluation committees.

Title: **Postgraduate Diploma in Production and Generation of Conventional Electricity**

Official Nº of Hours: **450 h.**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Awards the following

CERTIFICATE

to

Mr./Ms. _____, with identification number _____.

For having passed and accredited the following program

POSTGRADUATE DIPLOMA

in

Production and Generation of Conventional Electricity

This is a qualification awarded by this University, equivalent to 450 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

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

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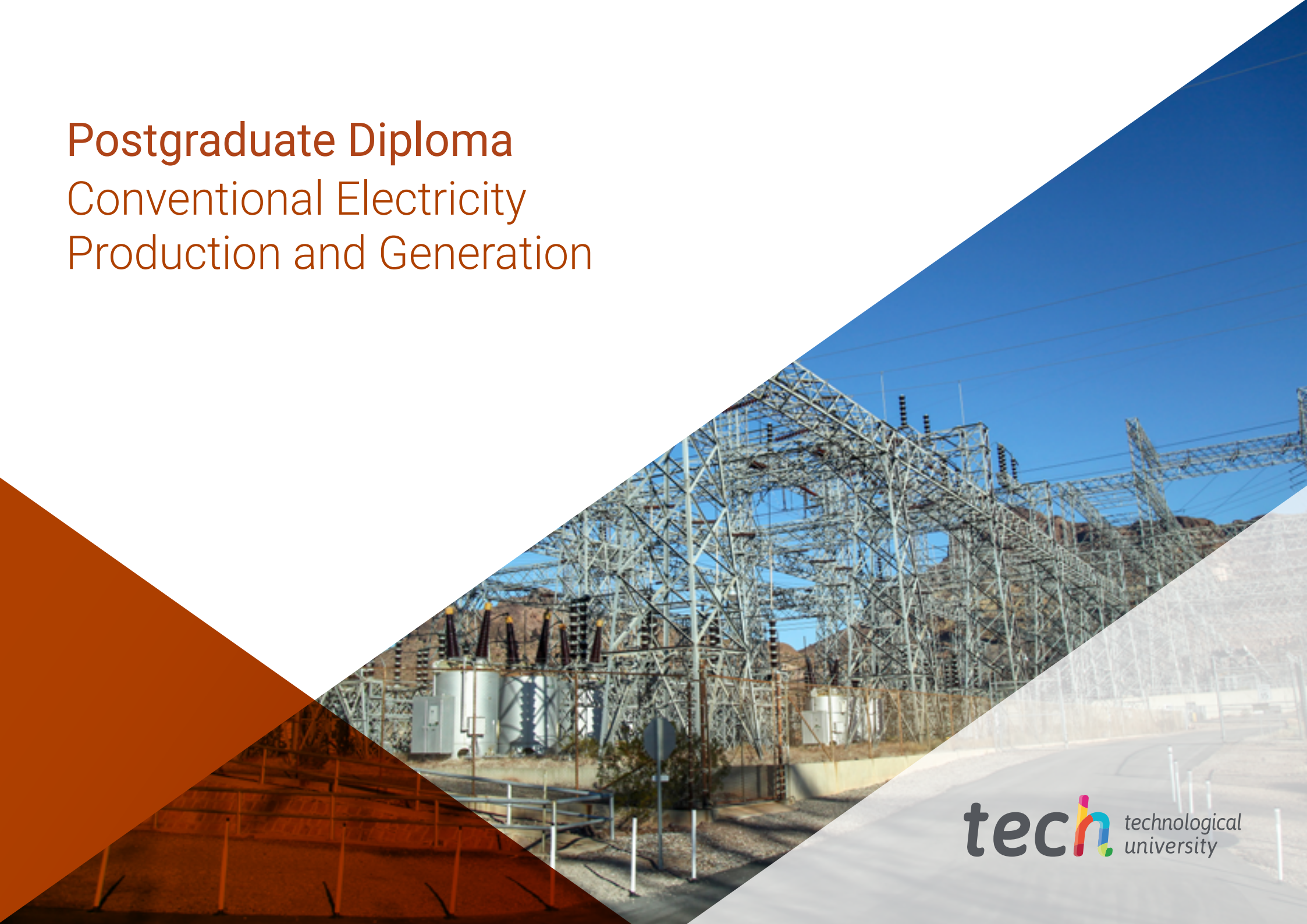

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