

# Postgraduate Certificate Instrumentation and Sensors





## Postgraduate Certificate Instrumentation and Sensors

Course Modality: Online

Duration: 6 weeks

Certificate: TECH Technological University

Teaching Hours: 150 h.

Website: [www.techtute.com/in/engineering/postgraduate-certificate/instrumentation-sensors](http://www.techtute.com/in/engineering/postgraduate-certificate/instrumentation-sensors)

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# 01

# Introduction

One of the most important achievements of mankind took place during the Industrial Revolution. The importance of having a sequential, strict and automated process as much as possible, in order to obtain a product in large quantities at a relatively low cost, was realized in that era. Electronic advances in the field of instrumentation and sensors, on the other hand, have further enhanced the creation of this industrial machinery, so engineers must have the necessary skills for both design and repair. This TECH program will become a useful work manual for professionals in the sector, providing them with the keys to the operation of this type of tool.







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*Understanding the characteristics of instrumentation and sensors in electronic systems will be essential to become proficient in the creation of these types of devices”*

The large-scale industry is based on the continuous use of machinery and processes controlled through mechanical and electronic devices. For this purpose, the use of electronics and instrumentation systems and sensors is required. In this way, progress in this field has also favored the improvement of industrial machinery. This is why many engineers want to specialize in this field, with top-level programs that will enable them to detect, from the first intervention, what the problem is in order to solve it successfully.

This Postgraduate Certificate in Instrumentation and Sensors of TECH aims to solve this demand of electronic engineers, and, for this, the program analyzes the different types of sensors and actuators found in industrial processes and specifies the types of control systems in order to understand the intervention of an actuator device depending on a physical or chemical variable to be measured. The distribution of established topics develops, in a coherent and organized manner, the functioning of these devices from two perspectives: the scientific vision of the phenomena involved and the practical applications.

An academic program that delves into the most relevant and useful aspects that professionals should know in order to be able to apply them to their daily practice, becoming professionals of reference in the sector. A 100% online program, will allow students to manage their own study time, meaning they are not hindered by fixed schedules or the need to commute to another physical location. They can access all the contents at any time of the day, allowing them to balance their professional and personal life with their academic life.

This **Postgraduate Certificate in Instrumentation and Sensors** contains the most complete and up-to-date program on the market. Its most notable features are:

- ◆ Case studies presented by engineering experts
- ◆ The graphic, schematic, and 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
- ◆ Special emphasis on innovative methodologies in Instruments and Sensors
- ◆ 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



*Your efforts in the field of instrumentation and sensors will improve a range of industrial processes"*

“ *Unlimited access to the theoretical and practical resources of this Postgraduate Certificate. All you need is a computer or mobile device with an internet connection”*

Its teaching staff includes professionals from the field of engineering, who contribute their work experience to this program, as well as renowned specialists from leading companies 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 educational experience designed to prepare students for real-life situations.

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

*An excellent academic journey that will help you specialize in Instrumentation and Sensors.*

*The online format of this program will allow students to combine their academic and working lives.*



# 02

# Objectives

The objective of this TECH program is to increase the expertise of engineers in the field of instrumentation and electronic sensors. In this way, at the end of the program, students will be able to design and repair electronic sensors that are indispensable in the daily life of citizens. An objective that will be achieved thanks to the multitude of theoretical and practical resources that students will have at their disposal, as well as their effort and dedication.







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*TECH gives you the opportunity to become an expert in Instrumentation and Sensors by taking Postgraduate Certificate”*



## General Objectives

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- ◆ Analyze technical documentation by examining the characteristics of different types of projects in order to determine the data necessary for their development
- ◆ Identify standardized symbology and plotting techniques in order to analyze drawings and diagrams of automatic systems and installations
- ◆ Identify breakdowns and malfunctions in order to supervise and/or maintain installations and associated equipment
- ◆ Determine quality parameters in the work carried out in order to develop the culture of evaluation and quality, and to be able to assess the quality management procedures





## Specific Objectives

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- ◆ Determine measuring and control devices according to their functionality
- ◆ Evaluate the different technical characteristics of measurement and control systems
- ◆ Develop and propose measurement and regulation systems
- ◆ Specify the variables that intervene in a process
- ◆ Justify the type of sensor involved in a process according to the physical or chemical parameter to be measured
- ◆ Establish appropriate control system performance requirements in accordance with system requirements
- ◆ Analyze the operation of typical measurement and control systems in industries

“

*Develop the skills needed to create world-class electronic sensors”*



# 03

## Course Management

The faculty of this TECH Postgraduate Certificate has extensive experience in the sector, as well as teaching and research experience. Professionals who have studied and trained to offer students the best qualification program of the moment on Instrumentation and Sensors, which will allow them to develop professionally in a field of action of great relevance today. Undoubtedly, the best team of professors that a university can have on staff.





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*Study with leading electronics experts  
and open the doors to a world full of  
numerous career options”*

## Management



### Ms. Casares Andrés, María Gregoria

- ♦ Associate Professors, Carlos III University of Madrid
- ♦ Degree in IT Polytechnic University of Madrid
- ♦ Research Sufficiency Polytechnic University of Madrid
- ♦ Research Sufficiency, Carlos III University of Madrid
- ♦ Evaluator and Creator of OCW courses at Carlos III University of Madrid
- ♦ INTEF courses tutor
- ♦ Support Technician, Ministry of Education Directorate General of Bilingualism and Quality of Education of the Community of Madrid
- ♦ Secondary Education Professor with specialty in IT
- ♦ Associate professor at the Pontificia de Comillas University
- ♦ Postgraduate Diploma in Teaching Unit, Community of Madrid
- ♦ Analyst/ IT Project manager, Banco Urquijo
- ♦ IT Analyst at ERIA



## Professors

### Mr. Jara Ivars, Luis

- ◆ Industrial Engineer -Sliding Ingenieros S.L
- ◆ Secondary Teacher of Electrotechnical and Automatic Systems Community of Madrid
- ◆ Secondary School Teacher Electronic Equipment Community of Madrid
- ◆ Secondary school Physics and Chemistry teacher
- ◆ Degree in Physical Sciences at UNED, Industrial Engineer UNED
- ◆ Master's Degree in Astronomy and Astrophysics, International University of Valencia
- ◆ Master's Degree in Occupational Risk Prevention, UNED
- ◆ Master's Degree in Teacher Training

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



# 04

## Structure and Content

Engineers who enroll in this TECH Postgraduate Certificate will be able to take a self-guided tour through the most up to date concepts and procedures of the moment. In this way, students will learn about different types of tools, such as flow, pressure and temperature sensors; physical and chemical variable sensors; types of automatic regulators or control applications in industry. All of these aspects are of great relevance for professionals in the sector.







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*The most complete and  
up-to-date syllabus on the  
current academic scene”*

## Module 1. Instruments and Sensors

- 1.1. Measurement
  - 1.1.1. Measurement and Control Characteristics
    - 1.1.1.1. Accuracy
    - 1.1.1.2. Loyalty
    - 1.1.1.3. Repeatability
    - 1.1.1.4. Reproducibility
    - 1.1.1.5. Derivatives
    - 1.1.1.6. Linearity
    - 1.1.1.7. Hysteresis
    - 1.1.1.8. Resolution
    - 1.1.1.9. Scope
    - 1.1.1.10. Errors
  - 1.1.2. Classification of Instruments
    - 1.1.2.1. According to its Functionality
    - 1.1.2.2. According to the Variable to Control
- 1.2. Regulation
  - 1.2.1. Regulatory Systems
    - 1.2.1.1. Open Loop Systems
    - 1.2.1.2. Closed Loop Systems
  - 1.2.2. Types of Industrial Processes
    - 1.2.2.1. Continuous Processes
    - 1.2.2.2. Discrete Processes
- 1.3. Caudal Sensors
  - 1.3.1. Flow Rate
  - 1.3.2. Units Used for Caudal Measurement
  - 1.3.3. Types of Caudal Sensors
    - 1.3.3.1. Volume Flow Measurement
    - 1.3.3.2. Flow Measurement by Mass
- 1.4. Pressure Sensors
  - 1.4.1. Pressure
  - 1.4.2. Units Used for Pressure Measurement
  - 1.4.3. Types of Pressure Sensors
    - 1.4.3.1. Pressure Measurement via Mechanical Elements
    - 1.4.3.2. Pressure Measurement via Electromechanical Elements
    - 1.4.3.3. Pressure Measurement via Electronic Elements
- 1.5. Temperature Sensors
  - 1.5.1. Temperature
  - 1.5.2. Units Used for Temperature Measurement
  - 1.5.3. Types of Temperature Sensors
    - 1.5.3.1. Bimetallic Thermometer
    - 1.5.3.2. Glass Thermometer
    - 1.5.3.3. Resistance Thermometer
    - 1.5.3.4. Thermistors
    - 1.5.3.5. Thermocouples
    - 1.5.3.6. Radiation Pyrometers
- 1.6. Level Sensors
  - 1.6.1. Liquids and Solids Level
  - 1.6.2. Units Used for Temperature Measurement
  - 1.6.3. Types of Level Sensors
    - 1.6.3.1. Liquid Level Gauges
    - 1.6.3.2. Solid Level Gauges

- 1.7. Sensors for Other Physical and Chemical Variables
  - 1.7.1. Sensors for Other Physical Variables
    - 1.7.1.1. Weight Sensors
    - 1.7.1.2. Speed Sensors
    - 1.7.1.3. Density Sensors
    - 1.7.1.4. Humidity Sensors
    - 1.7.1.5. Flame Sensors
    - 1.7.1.6. Solar Radiation Sensors
  - 1.7.2. Sensors for Other Chemical Variables
    - 1.7.2.1. Conduction Sensors
    - 1.7.2.2. pH Sensors
    - 1.7.2.3. Gas Concentration Sensors
- 1.8. Actuators
  - 1.8.1. Actuators
  - 1.8.2. Engines
  - 1.8.3. Servo-Valves
- 1.9. Automatic Control
  - 1.9.1. Automatic Regulation
  - 1.9.2. Types of Regulators
    - 1.9.2.1. Two-Step Controller
    - 1.9.2.2. Provider Controller
    - 1.9.2.3. Differential Controller
    - 1.9.2.4. Proportional-Differential Controller
    - 1.9.2.5. Integral Controller
    - 1.9.2.6. Proportional-Integral Controller
    - 1.9.2.7. Proportional-Integral-Differential Controller
    - 1.9.2.8. Digital Electronic Controller

- 1.10. Control Applications in Industry
  - 1.10.1. Selection Criteria of a Control System
  - 1.10.2. Examples of Typical Controls in Industry
    - 1.10.2.1. Ovens
    - 1.10.2.2. Dryer
    - 1.10.2.3. Combustion Control
    - 1.10.2.4. Level Control
    - 1.10.2.5. Heat Exchangers
    - 1.10.2.6. Central Nuclear Reactor



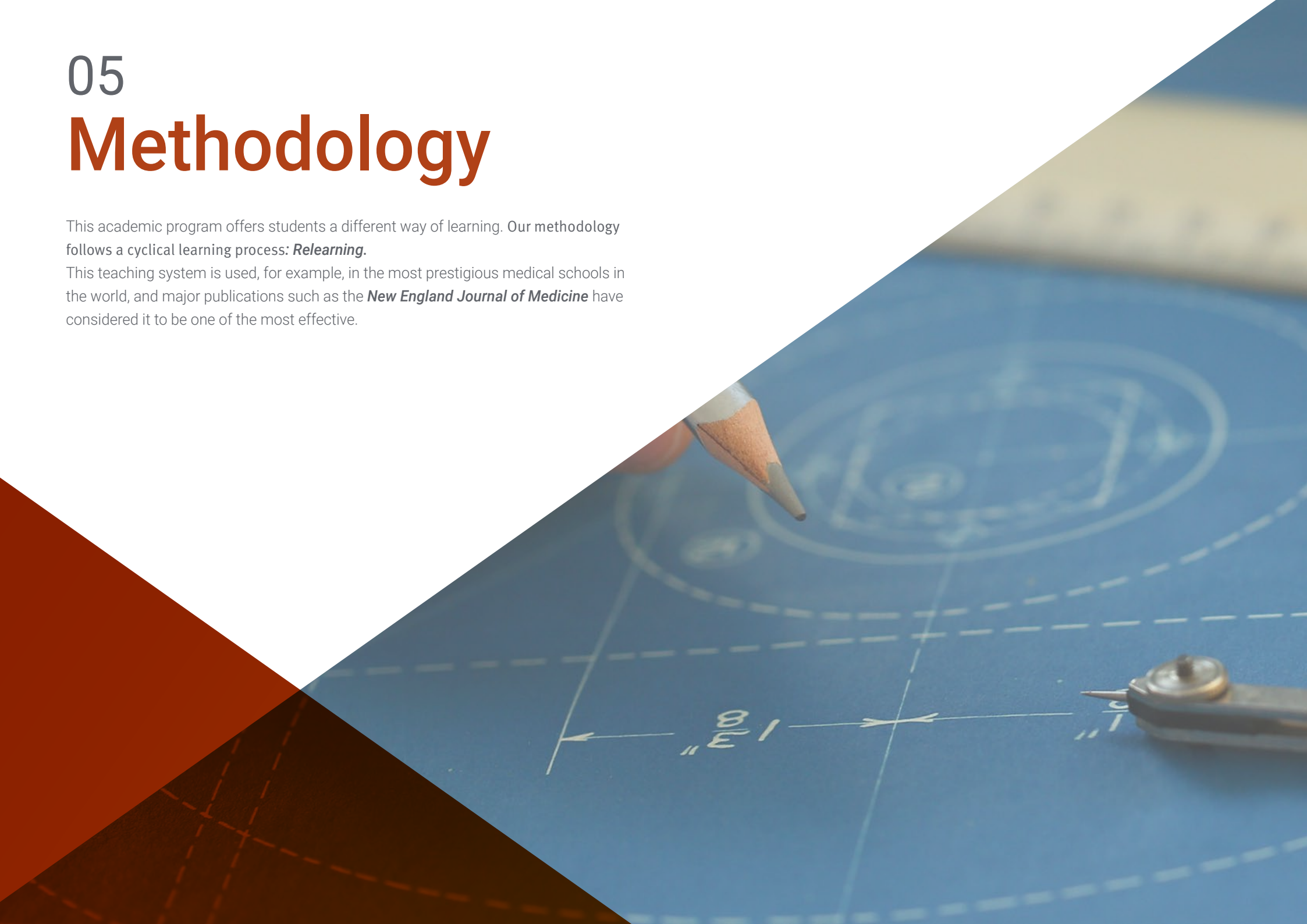
*A top-level academic journey  
that will help you open up new  
career opportunities”*

05

# Methodology

This academic program offers students a different way of learning. Our methodology follows a cyclical learning process: **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 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”*



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



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

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 prepare the executives of the future. This method, at the forefront of international teaching, is called Relearning.

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





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

This methodology has prepared 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 education, 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 adapted in 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.



### Practicing Skills and Abilities

They will carry out activities to develop specific competencies and skills in each thematic field. 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 assess and re-assess students' knowledge throughout the program, through assessment and self-assessment activities and exercises, so that they can see how they are achieving their goals.





06

# Certificate

The Postgraduate Certificate in Instrumentation and Sensors guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Technological University.



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



This **Postgraduate Certificate in Instrumentation and Sensors** contains the most complete and up-to-date educational program on the market.

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

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

Title: **Postgraduate Certificate in Instrumentation and Sensors**

Official N° of Hours: **150 h.**





## Postgraduate Certificate Instrumentation and Sensors

Course Modality: **Online**

Duration: **6 weeks**

Certificate: **TECH Technological University**

Teaching Hours: **150 h.**

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