Postgraduate Certificate
Automation and Robotics in Mechatronics Systems

tech *global university*

Postgraduate Certificate
Automation and Robotics in Mechatronics Systems

- » Modality: **online**
- » Duration: **12 weeks**
- » Certificate: **TECH Global University**
- » Credits: **12 ECTS**
- » Schedule: **at your own pace**
- » Exams: **online**

Website: **www.techtitute.com/us/engineering/postgraduate-certificate/automation-robotics-mechatronics-systems**

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01
Introduction

In recent decades, robotics has been integrated into industry along with other flexible automation systems. For this reason, the learning of engineers has been incorporating this discipline in their teachings in the specialties of automation as well as in electronics and mechanics. In this context, TECH has implemented an academic program based on the latest trends in the robotics field. The university program stands out for its multidisciplinary nature, while offering contents that combine science with technology. In addition, its 100% online content allows students to study it comfortably, only with a device with Internet access, and make a quality leap in their career.

Thanks to this Postgraduate Certificate, you will master the latest trends in robotic technology"

During the last years, Mechatronics has gained more and more prominence due to its contribution to technological innovation. Thanks to the advantages of automating machinery and creating intelligent products, companies are constantly seeking to raise their performance indicators to develop continuous improvement. Hence, they are looking for professionals with a high specialization in Automation and Robotics in Mechatronic Systems.

In this sense, TECH has designed an innovative syllabus in this regard. The academic itinerary contains the most advanced concepts and activities related to Automation and Robotics in Mechatronic Systems. Through the contents of this training, the graduates will obtain a deep scientific knowledge in mechanical and control aspects. To this end, the identification of the structure and basic specifications of a robot will be addressed, as well as the convenience of using it in the appropriate way.

Furthermore, with a 100% online methodology of this university program, graduates will be able to complete the program comfortably. For the analysis of its contents they will only need a device with Internet access, since the schedules and evaluation chronograms can be planned individually. In addition, the syllabus will be supported by the innovative *Relearning* teaching system which, through repetition, guarantees the mastery of the different concepts to be studied. At the same time, it mixes the learning process with real situations so that practical skills are acquired in a natural and progressive way, without extra effort.

This **Postgraduate Certificate in Automation and Robotics in Mechatronics Systems** contains the most complete and up-to-date program on the market. Its most notable features are:

- The development of case studies presented by experts in Automation and Robotics in Mechatronics Systems
- The graphic, schematic and eminently practical contents of the book provide updated and practical information on those 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

Stand out in a booming sector with enormous potential and become a part of the global change based on excellence"

" *Don't miss the opportunity to boost your career through this innovative program"*

Take the leap to the best Robotics and Mechatronics companies thanks to this cutting-edge TECH program.

You are just one click away from being part of the TECH community, the largest online university in the world.

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

The multimedia content, developed with the latest educational technology, will provide the professaional with situated and contextual learning, i.e., a simulated environment that will provide immersive education programmed to learn 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 students will be assisted by an innovative interactive video system created by renowned and experienced experts.

02
Objectives

The design of this program will enable specialists from disciplines such as Mechanical Engineering or Industrial Electronics to develop innovative technological products. In addition, robot transformations will be addressed to model mechanical systems using simulation software. In this way, graduates will join the most renowned companies to contribute their multidisciplinary profile and improve production.

"
With TECH you will take a quality leap in your career, controlling Robotics and its technological components"

General Objectives

- Present the elements that make up a robotic system
- Analyze the mathematical models used in the analysis and design of a robot
- Develop control methods used in a robot
- Present the programming languages used in various industrial robots

You will reach your goals thanks to TECH's didactic methodology and the support of the best professionals"
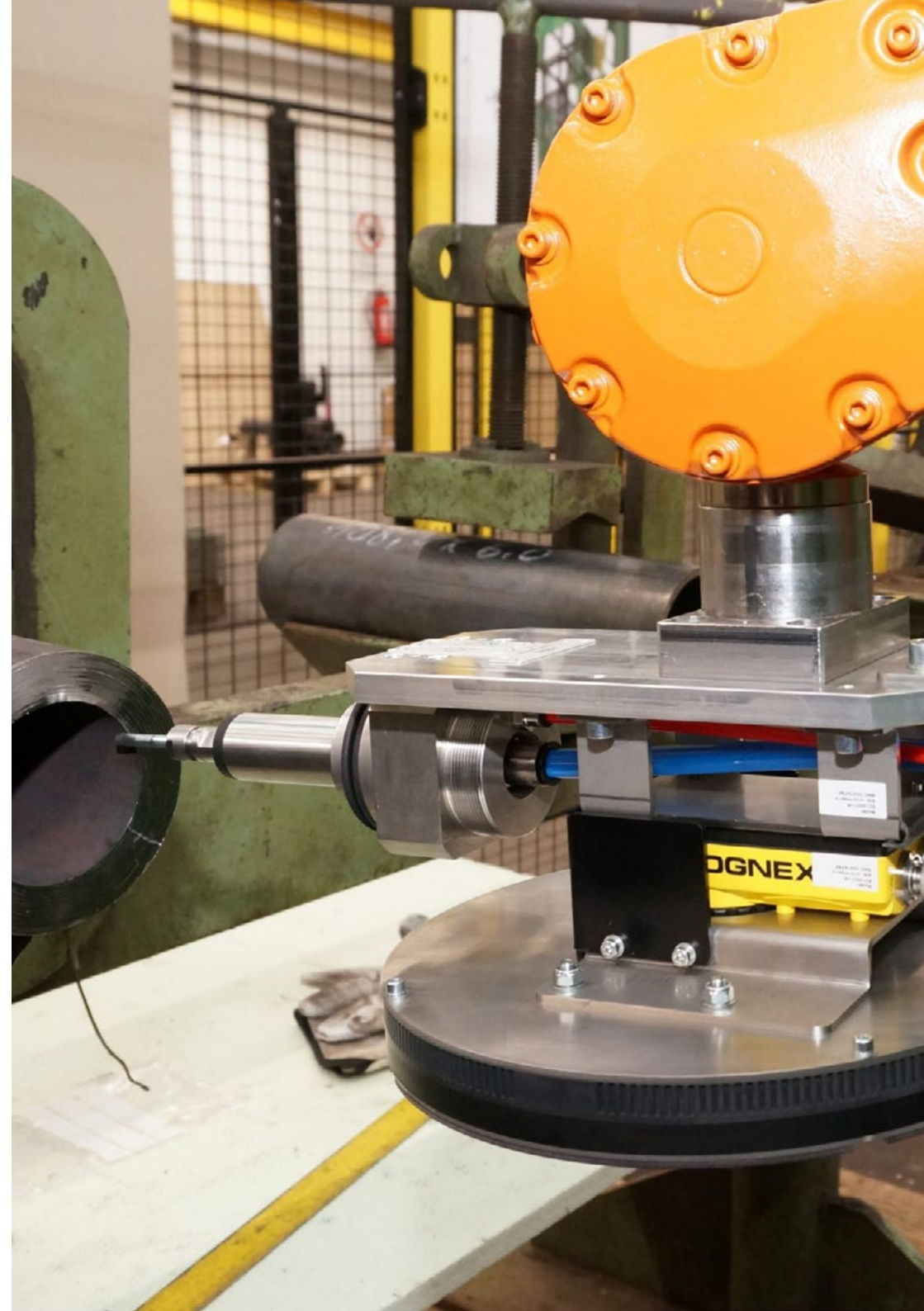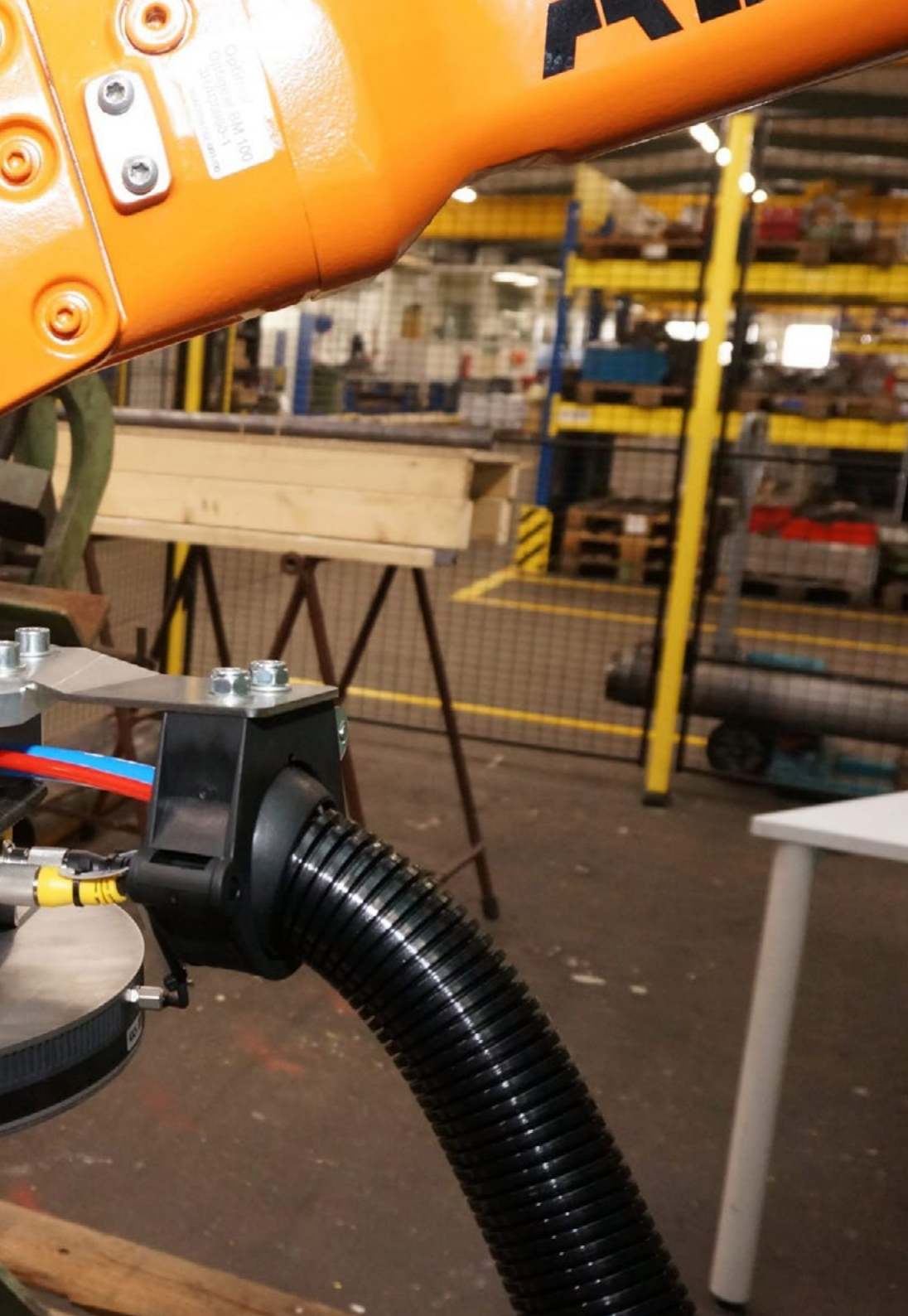
Specific Objectives

♦ Recognize and select the sensors and actuators involved in an industrial process according to their practical application

♦ Configure a sensor or an actuator according to the proposed technical requirements

♦ Design an industrial production process according to the proposed technical requirements

♦ Identify the elements that make up the controllers of industrial systems, relating their function with the elemenats that make up the automation processes

♦ Be able to configure and program a controller according to the technical requirements proposed in the process

♦ Work with the special characteristics of machine automation

♦ Be able to design an industrial production process according to the proposed technical requirements

03
Course Management

In its maxim of offering an elite education for all, TECH counts on renowned professionals so that the student acquires a solid knowledge in the Automation and Robotics in Mechatronic Systems specialty. For this reason, this Postgraduate Certificate has a highly qualified team with extensive experience in the sector, which will offer the best possible resources for students in the development of their skills during the course. In this way, students have the guarantees they need to specialise at an international level in a booming sector that will catapult them to professional success.

TECH puts at your disposal a teaching staff formed by true pioneers in the technological innovation of robotics"

International Guest Director

With an extensive background in the Technology industry, Hassan Showkot is a renowned **Computer Engineer** highly specialized in the implementation of advanced **robotic solutions** in a variety of fields. He also stands out for his **strategic vision** to manage multidisciplinary work teams and lead projects oriented to the specific needs of clients.

In this way, he has worked in international reference companies such as **Huawei** or **Omron Robotics and Safety Technologies.** Among his main achievements, he has created **innovative techniques** to improve both the reliability and safety of robotic systems. In turn, this has enabled many companies to improve their operational processes and automate complex routine tasks ranging from **inventory management to component manufacturing**. As a result, institutions have managed to reduce human errors in their work chains and significantly increase their **productivity** .

In addition, it has led the **Digital Transformation** of numerous entities that needed to increase their competitiveness in the market and ensure their long-term sustainability in the market. Consequently, it has integrated emerging technological tools such as **Artificial Intelligence, Machine Learning, Big Data, Internet of Things or Blockchain**. Thanks to this, organizations have used **predictive analytics** systems to anticipate both trends and needs, something fundamental to adapt to a constantly changing business environment. This has also contributed to optimize **informed strategic decision** making, based on large volumes of data and even patterns.

In addition, its ability to manage initiatives with interdisciplinary groups has been essential to boost collaboration between different corporate departments. As a result, he has fostered an **institutional culture** based on **innovation**, excellence and continuous improvement. Undoubtedly, this has given businesses a substantial competitive advantage.

Mr. Hassan, Showkot

- Director of Omron Robotics and Safety Technologies in Illinois, United States
- Program Manager at Seminet, San Jose, San Jose
- Systems Analyst at Corporación Miriam INC, Lima
- Software Engineer at Huawei, Shenzhen
- M.S. in Engineering Technology at Purdue University
- Master in Business Administration with specialization in Project Management from the
- Bachelor's Degree in Computer Science and Engineering from Shahjalal University of Science and Technology

Thanks to TECH, you will be able to learn with the best professionals in the world"

Management

Dr. López Campos, José Ángel

- Specialist in design and numerical simulation of mechanical systems
- Calculation engineer at ITERA TÉCNICA S.L
- PhD in Industrial in Engineering from the University of Vigo
- Professional Master's Degree in Automotive Engineering from the University of Vigo
- Professional Master's Degree in Competition Vehicle Engineering, Antonio de Nebrija University
- University Specialist FEM by the Polytechnic University of Madrid
- Degree in Mechanical Engineering from the University of Vigo

Professors

Mr. Bretón Rodríguez, Javier

- Industrial Engineering Specialist
- Industrial Technical Engineer at FLUNCK S.A
- Industrial Technical Engineer at the Ministry of Education and Science of the Government of Spain
- University teacher in the area of Systems and Automatic Engineering at the University of La Rioja
- Industrial Technical Engineer at the University of Zaragoza
- Industrial Engineer, University of La Rioja
- Postgraduate Certificate of Advanced Studies and Research Sufficiency in the Electronics Branch
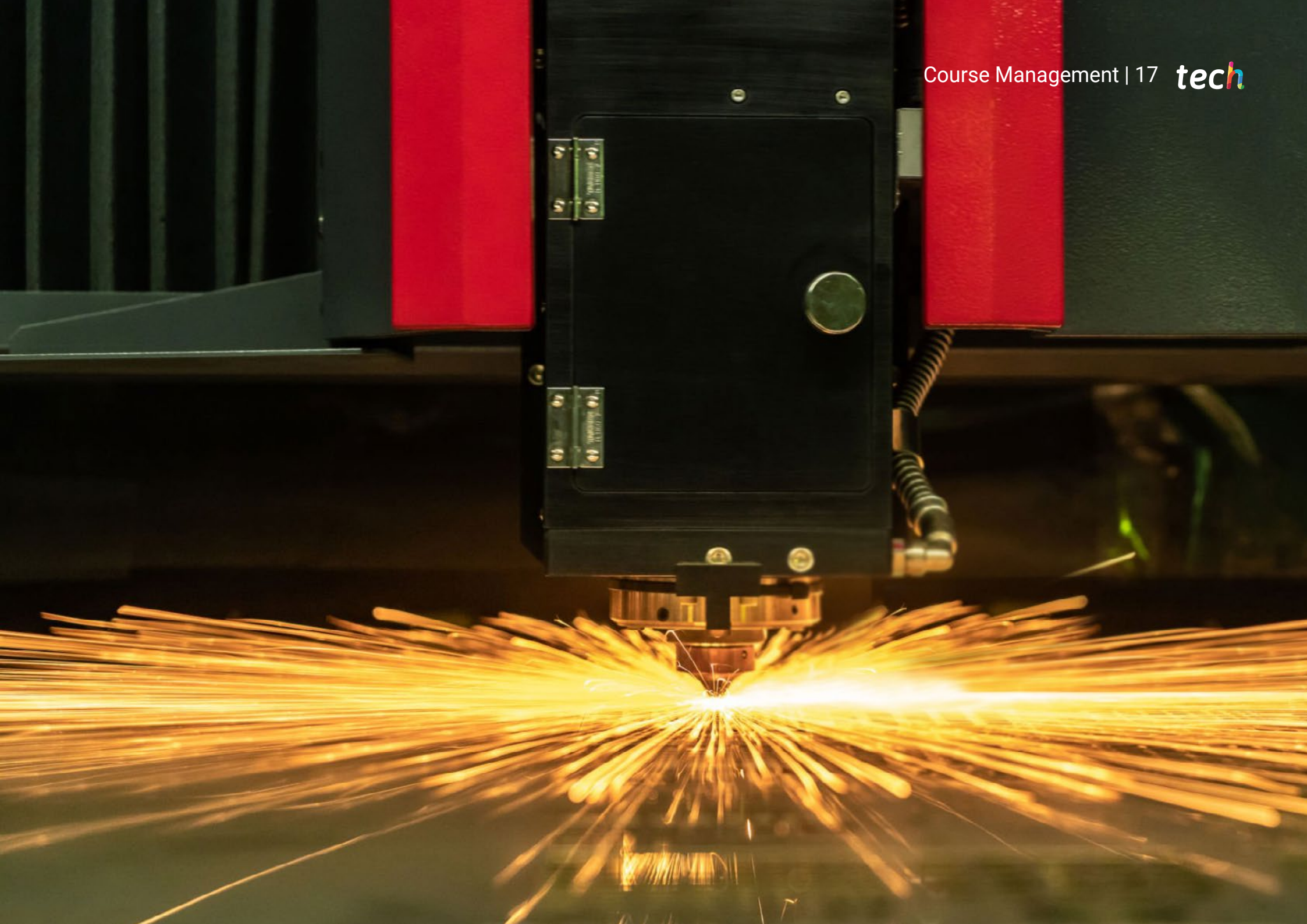
04
Structure and Content

The syllabus has been designed based on the requirements of robotics applied to mechatronic engineering, following the requirements proposed by the teaching team of this Postgraduate Certificate.

The syllabus includes a module that offers a broad perspective of automation and robotics in mechatronic systems from a global point of view for the sake of its application at an international level. In addition, it delves into the classification and applications of robots for students to overcome the challenge of achieving innovative manufacturing schemes. It will also address the kinematics of position and orientation with emphasis on the Denavit-Hartenberg formulation. In addition, programming systems will be covered in depth in order to master the various existing techniques.

"

You will have access to a syllabus developed by prestigious experts in Mechatronic Systems, which guarantees you a successful learning experience"

Module 1. Sensors and Actuators

1.1.   Sensors
    1.1.1.   Sensor Selection
    1.1.2.   Sensors in Mechatronic Systems
    1.1.3.   Application Examples

1.2.   Presence or Proximity Sensors
    1.2.1.   Limit Switches: Principle of Operation and Technical Characteristics
    1.2.2.   Inductive Detectors: Principle of Operation and Technical Characteristics
    1.2.3.   Capacitive Detectors: Principle of Operation and Technical Characteristics
    1.2.4.   Optical Detectors: Principle of Operation and Technical Characteristics
    1.2.5.   Ultrasonic Detectors: Principle of Operation and Technical Characteristics
    1.2.6.   Selection Criteria
    1.2.7.   Application Examples

1.3.   Position Sensors
    1.3.1.   Incremental Encoders: Principle of Operation and Technical Characteristics
    1.3.2.   Absolute Encoders: Principle of Operation and Technical Characteristics
    1.3.3.   Laser Sensors: Principle of Operation and Technical Characteristics
    1.3.4.   Magnetostrictive Sensors and Linear Potentiometers
    1.3.5.   Selection Criteria
    1.3.6.   Application Examples

1.4.   Temperature Sensors
    1.4.1.   Thermostats: Principle of Operation and Technical Characteristics
    1.4.2.   Resistance Thermometers: Principle of Operation and Technical Characteristics
    1.4.3.   Thermocouples: Principle of Operation and Technical Characteristics
    1.4.4.   Radiation Pyrometers: Principle of Operation and Technical Characteristics
    1.4.5.   Selection Criteria
    1.4.6.   Application Examples

1.5.   Sensors for the Measurement of Physical Variables in Processes and Machines
    1.5.1.   Pressure Operating Principle
    1.5.2.   Flow rate: Operating Principle
    1.5.3.   Level: Operating Principle
    1.5.4.   Sensors for Other Physical Variables
    1.5.5.   Selection Criteria
    1.5.6.   Application Examples

1.6.   Actuators
    1.6.1.   Actuator Selection
    1.6.2.   Actuators in Mechatronic Systems
    1.6.3.   Application Examples

1.7.   Electric Actuators
    1.7.1.   Relays and Contactors: Principle of Operation and Technical Characteristics
    1.7.2.   Rotary Motors: Principle of Operation and Technical Characteristics
    1.7.3.   Stepper Motors: Principle of Operation and Technical Characteristics
    1.7.4.   Servomotors: Principle of Operation and Technical Characteristics
    1.7.5.   Selection Criteria
    1.7.6.   Application Examples

1.8.   Pneumatic Actuators
    1.8.1.   Valves and Servovalves Principle of Operation and Technical Characteristics
    1.8.2.   Pneumatic Cylinders: Principle of Operation and Technical Characteristics
    1.8.3.   Pneumatic Motors: Principle of Operation and Technical Characteristics
    1.8.4.   Vacuum Clamping: Principle of Operation and Technical Characteristics
    1.8.5.   Selection Criteria
    1.8.6.   Application Examples

1.9.   Hydraulic Actuators
    1.9.1.   Valves and Servovalves Principle of Operation and Technical Characteristics
    1.9.2.   Hydraulic Cylinders: Principle of Operation and Technical Characteristics
    1.9.3.   Hydraulic Motors: Principle of Operation and Technical Characteristics
    1.9.4.   Selection Criteria
    1.9.5.   Application Examples

1.10.   Example of Application of Sensor and Actuator Selection in Machine Design
    1.10.1.   Description of the Machine to be Designed
    1.10.2.   Sensor Selection
    1.10.3.   Actuator Selection

Module 2. Axis Control, Mechatronic Systems and Automation

2.1.   Automation of Production Processes
    2.1.1.   Automation of production processes
    2.1.2.   Classification of Control Systems
    2.1.3.   Technologies Used
    2.1.4.   Machine Automation and/or Process Automation
2.2.   Mechatronic Systems: Elements
    2.2.1.   Mechatronic Systems
    2.2.2.   The Programmable Logic Controller as a Discrete Process Control Element
    2.2.3.   The Controller as a Control Element for Continuous Process Control
    2.2.4.   Axis and Robot Controllers as Position Control Elements
2.3.   Discrete Control with Programmable Logic Controllers (PLC's)
    2.3.1.   Hardwired Logic vs. Programmed Logic
    2.3.2.   Control with PLC's
    2.3.3.   Field of Application of PLCs
    2.3.4.   Classification of PLCs
    2.3.5.   Selection Criteria
    2.3.6.   Application Examples
2.4.   PLC Programming
    2.4.1.   Representation of Control Systems
    2.4.2.   Cycle of Operation
    2.4.3.   Configuration Possibilities
    2.4.4.   Variable Identification and Address Assignment
    2.4.5.   Programming Languages
    2.4.6.   Instruction Set and Programming Software
    2.4.7.   Programming Example
2.5.   Methods of Describing Sequential Drives
    2.5.1.   Design of Sequential Drives
    2.5.2.   GRAFCET as a Method for Describing Sequential Drives
    2.5.3.   Types of GRAFCET
    2.5.4.   GRAFCET Elements
    2.5.5.   Standard Symbology
    2.5.6.   Application Examples

2.6.   Structured GRAFCET
    2.6.1.   Structured Design and Programming of Control Systems
    2.6.2.   Modes of Operation
    2.6.3.   Security/Safety
    2.6.4.   Hierarchical GRAFCET Diagrams
    2.6.5.   Structured Design Examples
2.7.   Continuous Control by Means of Controllers
    2.7.1.   Industrial Controllers
    2.7.2.   Scope of Application of the Regulators. Classification
    2.7.3.   Selection Criteria
    2.7.4.   Application Examples
2.8.   Machine Automation
    2.8.1.   Machine Automation
    2.8.2.   Speed and Position Control
    2.8.3.   Safety Systems
    2.8.4.   Application Examples
2.9.   Position Control by Axis Control
    2.9.1.   Position Control
    2.9.2.   Field of Application of Axis Controllers. Classification
    2.9.3.   Selection Criteria
    2.9.4.   Application Examples
2.10.   Example of Application of Equipment Selection in Machine Design
    2.10.1.   Description of the Machine to be Designed
    2.10.2.   Equipment Selection
    2.10.3.   Resolved Application

Methodology

This 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.

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 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.

01 learning from evidence

02 relearning from evidence

03 testing

04 learning from an expert

05 neurocognitive context dependent learning

06 Von-Restorff effect

07 case based learning through storytelling

08 competencies testing (retesting)

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.

20%

25%

4%

3%

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 Automation and Robotics in Mechatronics Systems guarantees you, in addition to the most rigorous and updated training, access to a Executive Master's Degree issued by TECH Global University.

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

This program will allow you to obtain your **Postgraduate Certificate in Automation and Robotics in Mechatronics Systems** endorsed by **TECH Global University**, the world's largest online university.

TECH Global University is an official European University publicly recognized by the Government of Andorra (*official bulletin*). Andorra is part of the European Higher Education Area (EHEA) since 2003. The EHEA is an initiative promoted by the European Union that aims to organize the international training framework and harmonize the higher education systems of the member countries of this space. The project promotes common values, the implementation of collaborative tools and strengthening its quality assurance mechanisms to enhance collaboration and mobility among students, researchers and academics.
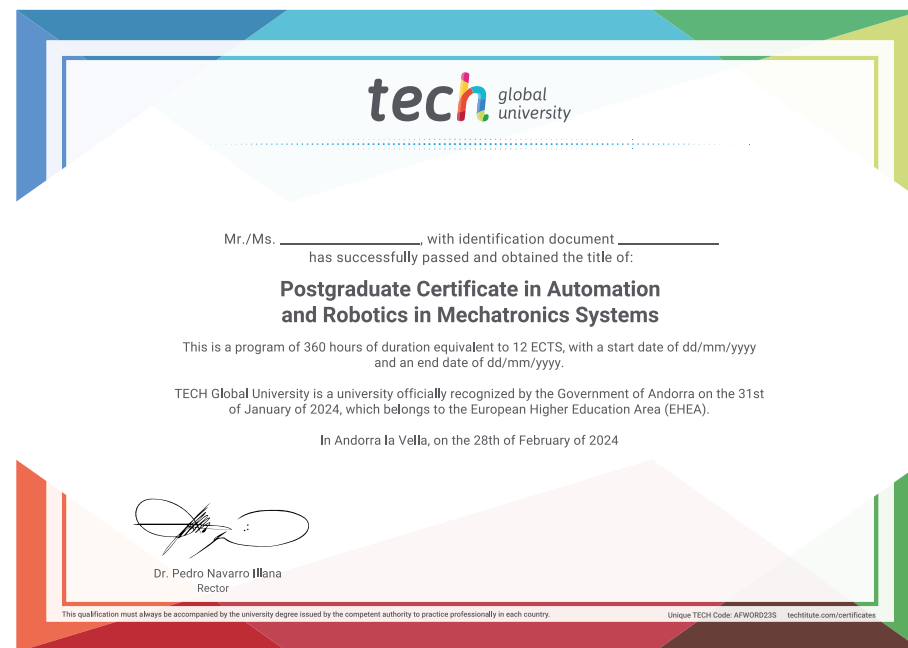
This **TECH Global University** title is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Postgraduate Certificate in Automation and Robotics in Mechatronics Systems**

Modality: **online**

Duration: **12 weeks**

Accreditation: **12 ECTS**

tech global university

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

Postgraduate Certificate in Automation and Robotics in Mechatronics Systems

This is a program of 360 hours of duration equivalent to 12 ECTS, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

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

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

Dr. Pedro Navarro Illana
Rector

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 diploma issued with an apostille, TECH Global University will make the necessary arrangements to obtain it, at an additional cost.

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Postgraduate Certificate
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» Modality: **online**
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» Certificate: **TECH Global University**
» Credits: **12 ECTS**
» Schedule: **at your own pace**
» Exams: **online**

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