

# Postgraduate Certificate Machines and Mechatronic Systems



## Postgraduate Certificate Machines and Mechatronic Systems

- » Modality: online
- » Duration: 12 weeks
- » Certificate: TECH Technological University
- » Dedication: 16h/week
- » Schedule: at your own pace
- » Exams: online

Website: [www.techtitute.com/in/engineering/postgraduate-certificate/machines-mechatronic-systems](http://www.techtitute.com/in/engineering/postgraduate-certificate/machines-mechatronic-systems)

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# 01

# Introduction

Mechatronics Engineering generates a great impact on society since its main objective is to modernize production processes and facilitate human activities. Thanks to it, the population enjoys intelligent products ranging from mobile devices to automobiles through the pharmaceutical industry. In this context, TECH has implemented an academic program that employs the most innovative and outstanding technology in the mechatronics field. The university program stands out for its focus on interdisciplinarity and its internationally renowned teaching staff. In addition, its 100% online resources allow the student to study it comfortably, only with a device with Internet access.





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*Thanks to this innovative program, you will provide innovative technological solutions and contribute to social progress”*

In recent decades, there have been advances in both technology and automation. As a consequence, this has led to an increase in the demand for industrial mechanical technicians with a high level of knowledge in mechatronics. In this sense, mechatronics provides numerous advantages, including optimization and innovation in production processes. Aware of this, companies are increasingly demanding professionals in the mechatronics field who are responsible for raising their indicators and improving the working conditions of employees.

Faced with this reality, TECH has designed a study program that perfectly combines mechanics with electronics and technology. The resources invested in training and the support of a first class teaching staff guarantee the creation of automated systems that ensure greater productivity and efficiency in the industry. In this way, students will be qualified to lead research and development teams, leading to the creation of innovative technological solutions.

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 that relies on repetition to guarantee the mastery of its different aspects. At the same time, it mixes the learning process with real situations so that knowledge is acquired in a natural and progressive way, without the extra effort of memorizing.

This **Postgraduate Certificate in Machines and Mechatronic Systems** contains the most complete and up-to-date program on the market. The most important features include:

- ♦ The development of case studies presented by experts in Machines and Mechatronic Systems
- ♦ The graphic, schematic and practical contents with which it is conceived provide cutting- Therapeutics 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"*

“

*Further your knowledge and join the most prestigious companies in the technology sector”*

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

The multimedia content, developed with the latest educational technology, will provide the professional with situated and contextual learning, i.e., a simulated environment that will provide immersive education programmed to 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.

*You will create automated systems that guarantee greater efficiency and productivity in industry.*

*Thanks to TECH you will master Mechatronics to contribute to social progress.*





# 02

# Objectives

The program design of this Postgraduate Certificate will allow students and computer, electronic or industrial engineers to update themselves in the profession after analyzing key aspects in Machines and Mechatronic Systems. With programming based on the latest technologies, graduates will develop full faculties in a versatile and global field of engineering, giving a leap in their career.







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*The goal of TECH is you: give your career the boost it needs and specialize in the mechatronics sector"*



## General Objectives

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- ♦ Develop the necessary basis to enable and facilitate versatile learning of new methodologies
- ♦ Identify and analyze the main types of industrial mechanisms
- ♦ Identify the sensors and actuators of a process according to their functionality
- ♦ Delve into CAD design methodology and apply it to mechatronic projects
- ♦ Identify the different equipment involved in the control of industrial processes
- ♦ Establish the analysis typology and FEM calculation model to reproduce the real test of a mechatronic component
- ♦ Present the elements that make up a robotic system
- ♦ Examine the mathematical models governing multibody mechanics
- ♦ Define the fundamentals of embedded systems, including their architecture, components and applications in modern engineering
- ♦ Determine the different models of embedded manufacturing present in the industrial world



*You will achieve your goals thanks to our tools, and you will be accompanied along the way by leading professionals"*







## Specific Objectives

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- ◆ Recognize the different methods of motion transmission and transformation
- ◆ Identify the main types of machines and mechanisms that allow the transmission and transformation of motion
- ◆ Define the bases for the study of static and dynamic stresses of mechanical systems
- ◆ Establish the basis for the study, design and evaluation of the following mechanical elements and systems: gears, shafts and shafts, bearings, springs, mechanical joints, flexible mechanical elements, brakes and clutches
- ◆ Identify the elements that make up the controllers of industrial systems, relating their function with the elements 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 students acquire a solid knowledge in the specialty of Mechatronic Machines and Systems. 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 program. 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.



“

*Succeed with the best and acquire the knowledge and skills you need to embark on the mechatronics sector”*

## 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

### Ms. Suárez García, Sofía

- ♦ Researcher and specialist in Industrial Engineering
- ♦ Mechanical engineer in preparation and calculation of models by the Finite Element Method at the University of Vigo
- ♦ University teaching assistant in several undergraduate courses
- ♦ Professional Master's Degree in Industrial Engineering at the University of Vigo
- ♦ Degree in Mechanical Engineering from the University of Vigo





# 04

# Structure and Content

This TECH program consists of 2 academic modules. The first addresses fundamental topics such as transformation and transmission of motion, machine stresses, gears, bearings, springs, process automation, and mechanical joining elements. The second focuses on axis control, mechatronic systems and automation, including the use of programmable logic controllers, PLC programming, methods for describing sequential automation, controller control, position control and equipment selection for machine design. All this from an innovative learning methodology 100% online.





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*No rigid schedules or evaluation timelines: that's what this TECH program is all about"*



## Module 1. Mechatronics Machines and Systems

- 1.1. Motion Transformation Systems
  - 1.1.1. Complete Circular Transformation: Reciprocating Circular
  - 1.1.2. Full Circular Transformation: Continuous Rectilinear
  - 1.1.3. Intermittent Motion
  - 1.1.4. Straight Line Mechanisms
  - 1.1.5. Stopping Mechanisms
- 1.2. Machines and Mechanisms: Motion Transmission
  - 1.2.1. Linear Motion Transmission
  - 1.2.2. Circular Motion Transmission
  - 1.2.3. Transmission of Flexible Elements: Belts and Chains
- 1.3. Machine Stresses
  - 1.3.1. Static Stresses
  - 1.3.2. Failure Criteria
  - 1.3.3. Fatigue in Machines
- 1.4. Gears
  - 1.4.1. Types of Gears and Manufacturing Methods
  - 1.4.2. Geometry and Kinematics
  - 1.4.3. Gear Trains
  - 1.4.4. Force Analysis
  - 1.4.5. Gear Strength
- 1.5. Shafts
  - 1.5.1. Stresses in Shafts
  - 1.5.2. Design of Shafts and Axles
  - 1.5.3. Rotodynamics
- 1.6. Bearings
  - 1.6.1. Types of Rolling Bearings
  - 1.6.2. Bearing Calculation
  - 1.6.3. Selection Criteria
  - 1.6.4. Mounting, Lubrication and Maintenance Techniques

- 1.7. Springs
  - 1.7.1. Types of Springs
  - 1.7.2. Helical Springs
  - 1.7.3. Energy Storage by Means of Springs
- 1.8. Mechanical Connecting Elements
  - 1.8.1. Types of Joints
  - 1.8.2. Design of Non-Permanent Joints
  - 1.8.3. Design of Permanent Connections
- 1.9. Transmissions by Means of Flexible Elements
  - 1.9.1. Straps
  - 1.9.2. Roller Chains
  - 1.9.3. Wire Ropes
  - 1.9.4. Flexible Shafts
- 1.10. Brakes and Clutches
  - 1.10.1. Types of Brakes/clutches
  - 1.10.2. Friction Materials
  - 1.10.3. Calculation and Sizing of Clutches
  - 1.10.4. Brake Calculation and Sizing

## 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
  - 2.7.4. Selection Criteria
  - 2.7.5. Application Examples
- 2.8. Machine Automation
  - 2.8.1. Machine Automation
  - 2.8.3. Speed and Position Control
  - 2.8.4. Safety Systems
  - 2.8.5. 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



*You will benefit from the excellence of TECH's innovative Relearning system for your theoretical and practical training. Enroll now!"*

05

# 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.





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*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.

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*At TECH, you will experience a learning methodology that is shaking the foundations of traditional universities around the world”*



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



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

### A learning method that is different and innovative

This TECH program is an intensive educational program, created from scratch, which presents the most demanding challenges and decisions in this field, both nationally and internationally. This methodology promotes personal and professional growth, representing a significant step towards success. The case method, a technique that lays the foundation for this content, ensures that the most current economic, social and professional reality is taken into account.

“*Our program prepares you to face new challenges in uncertain environments and achieve success in your career”*

The case method is the most widely used learning system in the best faculties in the world. The case method was developed in 1912 so that law students would not only learn the law based on theoretical content. It consisted of presenting students with real-life, complex situations for them to make informed decisions and value judgments on how to resolve them. In 1924, Harvard adopted it as a standard teaching method.

What should a professional do in a given situation? This is the question that you are presented with in the case method, an action-oriented learning method. Throughout the program, the studies will be presented with multiple real cases. They will have to combine all their knowledge and research, and argue and defend their ideas and decisions.

## Relearning Methodology

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

We enhance the Case Study with the best 100% online teaching method: Relearning.

*In 2019, we obtained the best learning results of all online universities in the world.*

At TECH, you will learn using a cutting-edge methodology designed to train the executives of the future. This method, at the forefront of international teaching, is called Relearning.

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





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

This methodology has trained more than 650,000 university graduates with unprecedented success in fields as diverse as biochemistry, genetics, surgery, international law, management skills, sports science, philosophy, law, engineering, journalism, history, and financial markets and instruments. All this in a highly demanding environment, where the students have a strong socio-economic profile and an average age of 43.5 years.

*Relearning will allow you to learn with less effort and better performance, involving you more in your training, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation for success.*

From the latest scientific evidence in the field of neuroscience, not only do we know how to organize information, ideas, images and memories, but we know that the place and context where we have learned something is fundamental for us to be able to remember it and store it in the hippocampus, to retain it in our long-term memory.

In this way, and in what is called neurocognitive context-dependent e-learning, the different elements in our program are connected to the context where the individual carries out their professional activity.



This program offers the best educational material, prepared with professionals in mind:



### Study Material

All teaching material is produced by the specialists who teach the course, specifically for the course, so that the teaching content is highly specific and precise.

These contents are then applied to the audiovisual format, to create the TECH online working method. All this, with the latest techniques that offer high quality pieces in each and every one of the materials that are made available to the student.



### Classes

There is scientific evidence suggesting that observing third-party experts can be useful.

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



### Practising Skills and Abilities

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



### Additional Reading

Recent articles, consensus documents and international guidelines, among others. In TECH's virtual library, students will have access to everything they need to complete their course.





**Case Studies**

Students will complete a selection of the best case studies chosen specifically for this program. Cases that are presented, analyzed, and supervised by the best specialists in the world.



**Interactive Summaries**

The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

This exclusive educational system for presenting multimedia content was awarded by Microsoft as a "European Success Story".



**Testing & Retesting**

We periodically evaluate and re-evaluate students' knowledge throughout the program, through assessment and self-assessment activities and exercises, so that they can see how they are achieving their goals.





06

# Certificate

The Postgraduate Certificate in Machines and Mechatronic Systems 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 Machines and Mechatronic Systems** contains the most complete and up-to-date 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 Machines and Mechatronic Systems**

Official N° of Hours: **300 h.**



\*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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