

# Postgraduate Diploma

## Structures, Materials and Dynamics in Mechanical Engineering



## Postgraduate Diploma Structures, Materials and Dynamics in Mechanical Engineering

- » Modality: online
- » Duration: 6 months
- » Certificate: TECH Global University
- » Credits: 24 ECTS
- » Schedule: at your own pace
- » Exams: online

Website: [www.techtitude.com/us/engineering/postgraduate-diploma/postgraduate-diploma-structures-materials-dynamics-mechanical-engineering](http://www.techtitude.com/us/engineering/postgraduate-diploma/postgraduate-diploma-structures-materials-dynamics-mechanical-engineering)

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# 01

# Introduction

This program presents the design aspects necessary to master, from a professional point of view, the design of structures and installations in buildings for residential, commercial and industrial use, such as air conditioning, ventilation, water, sanitation, fire protection, as well as special installations such as those for medical gases or fuels, and those that are not mechanical but fall within the scope of a mechanical engineer.

It also delves into the principles of advanced machine dynamics, including the study of vibration and resonance phenomena, as well as the necessary aspects to master the behavior of materials used in engineering, not only metals, but also polymeric, ceramic, composite and nanomaterials.





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*Mechanical engineering has been supported in recent years by new technologies, so professionals in this sector must have extensive digital skills"*

The TECH Postgraduate Diploma in Structures, Materials and Dynamics in Mechanical Engineering is a program specifically designed for professionals who need to strengthen their knowledge of both the conventional aspects of their professional activity and the most innovative aspects.

It has an international focus, with content based on that of the most prestigious universities in the world and is aligned with the recommendations of professional associations such as ASME (American Society of Mechanical Engineers) and IMechE (Institution of Mechanical Engineers).

The use of the case method facilitates the learning of concepts by avoiding systematic memorization and repetitive performance of complex calculations.

The content of the Postgraduate Diploma combines the traditional, but necessary, aspects of the profession with the most innovative aspects, which are renewed in each edition.

With this prestigious training, students will learn to effectively face the challenges of the mechanical engineering profession by mastering all aspects of mechanics and gaining in-depth knowledge of innovation management and continuous improvement processes.

This Postgraduate Diploma provides the necessary foundations to maintain an attitude of active observation of innovation, which allows professionals to remain updated and maintain a capacity to adapt to technological changes.

As it is a 100% online specialisation, the student is not bound by fixed schedules or the need to move to another physical location, rather, they can access the content at any time of the day, balancing their professional or personal life with their academic life.

This **Postgraduate Diploma in Structures, Materials and Dynamics in Mechanical Engineering** is the most comprehensive and up-to-date educational program on the market. The most important features of the program include:

- ♦ The development of case studies presented by experts in Engineering Mechanisms
- ♦ 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 self-assessment can be used to improve learning.
- ♦ Special emphasis on innovative methodologies in Engineering Mechanisms.
- ♦ 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



*The completion of this Postgraduate Diploma will place Mechanical Engineering professionals at the forefront of the latest developments in the sector"*

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*This Postgraduate Diploma is the best investment you can make in selecting an updated program in the field of Engineering Mechanisms. We offer you quality and free access to content"*

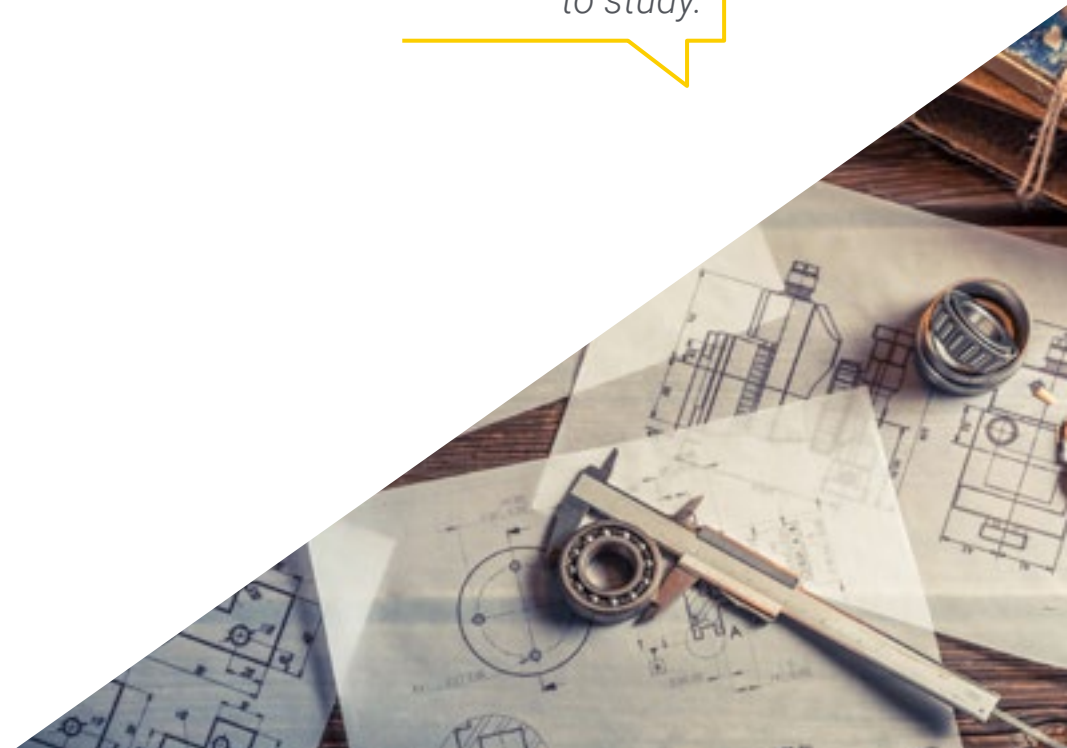
The teaching staff includes professionals from the engineering sector, who bring their experience to this training program, as well as renowned specialists from leading societies and prestigious universities.

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 immersive training programmed 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 engineering experts.

*This training comes with the best didactic material, providing you with a contextual approach that will facilitate your learning.*

*This 100% online Postgraduate Diploma will allow you to combine your studies with your professional work. You choose where and when to study.*





# 02 Objectives

The Postgraduate Diploma in Structures, Materials and Dynamics in Mechanical Engineering is aimed at facilitating the performance of the professional to acquire and know the main developments in this field, which will allow him to practice his profession with the highest quality and professionalism.





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*Our goal is to make you the best professional  
in your sector. And for this we have the best  
methodology and content"*



## General Objectives

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- ♦ Provide scientific and technological training for the professional practice of Mechanical Engineering
- ♦ Gain complex knowledge of engineering project management and continuous process improvement
- ♦ Gain complex knowledge of the design of machine elements, engines, structures and installations, including the choice of materials, their method of manufacture and reliability, safety and environmental considerations
- ♦ Delve into the necessary knowledge of Industry 4.0 applied to Mechanical Engineering
- ♦ Delve into the necessary knowledge of advanced and innovative applications of Mechanical Engineering





## Specific Objectives

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### Module 1. Structures and Installations

- ♦ Analyze and evaluate different mold forming processes
- ♦ Analyze and evaluate different plastic deformation forming processes
- ♦ Analyze and evaluate different material loss forming processes
- ♦ Analyze and evaluate the different heat treatments on machine elements
- ♦ Analyze and evaluate paint and coating application systems
- ♦ Analyze and evaluate the forming processes of polymers and ceramic materials
- ♦ Analyze and evaluate the manufacturing processes of complex materials
- ♦ Analyze and evaluate the different additive manufacturing processes

### Module 2. Advanced Dynamics

- ♦ Create, analyze and evaluate robust manufacturing processes to ensure the quality of the finished product
- ♦ Know the principles of nanomaterials
- ♦ Understand, analyze and evaluate the processes of corrosion and degradation of materials
- ♦ Evaluate and analyze the different techniques for non-destructive testing of materials

### Module 3. Materials

- ♦ Analyze and evaluate materials used in engineering based on their properties
- ♦ Analyze and evaluate metallic materials, both ferrous and non-ferrous
- ♦ Analyze and evaluate polymeric, ceramic and composite materials
- ♦ Analyze and evaluate materials used in additive manufacturing

### Module 4. Mechanics 4.0

- ♦ Master the principles of Industry 4.0 and its applications in Mechanical Engineering
- ♦ Create, evaluate and analyze designs that combine mechanics and electronics
- ♦ Create, evaluate and analyze mechanical systems including sensing, detection, actuators, control systems and machine vision
- ♦ Create, evaluate and analyze digital twins of mechanical systems
- ♦ Evaluate and analyze applications of Internet of Things, Cloud Computing, Big Data, Machine Learning and Artificial Intelligence in Mechanical Engineering
- ♦ Master the principles of reliability, availability, maintainability and safety (RAMS) engineering
- ♦ Evaluate and analyze the reliability of elements and systems using both qualitative and quantitative systems
- ♦ Master the mathematics used in reliability analysis
- ♦ Design accelerated life testing and reliability improvement plans on mechanical components



*Join us and we will help you  
achieve professional excellence"*



03

# Course Management

In our university we have professionals specialized in each area of knowledge, who pour into our specializations the experience of their work.





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*Our university employs the best professionals from different areas, who pour their knowledge into the elaboration of this complete program"*

## Management



### Mr. Asiain Sastre, Jorge

- Industrial Technical Engineer - Mechanics. University of Salamanca.
- Director and Co-Founder of AlterEvo Ltd. Professor of Mechanical Engineering
- Chartered Engineer member of Institution of Mechanical Engineers (CEng MIMechE)
- Master's Degree in Automotive Engineering
- MBA

## Professors

### Mr. Berdún Barbero, Daniel

- ♦ Industrial Engineering. School of Industrial Engineering
- ♦ Technical Office Manager at INSTER

### Mr . De Lama Burgos, Carlos

- ♦ Technical Advisor at the Association of Industrial Technical Engineers of Madrid.
- ♦ Technical and legal advice in the field of industrial engineering
- ♦ Industrial Safety
- ♦ Professor at the School of Architecture, Engineering and Design of the Universidad Europa de Madrid.

### Mr. Iglesias Alonso, Luis

- ♦ Certification Engineer in charge of Electrical Safety, Batteries and Electromagnetic Compatibility at SCANIA
- ♦ Vice President of the Technical Commission of Production and Launching of New Products, in the Spanish Association of Automotive Professionals (ASEPA)
- ♦ Foundation of Eleanor Homologaciones. Currently performing supervisory duties

### Mr. Panero, David

- ♦ Mechanical Engineer in Mechanical Design Department, HoribaAutomotive Test Systems, Madrid, Spain
- ♦ Double Master's Degree in Mechatronics Engineering and Industrial Technology Engineering

### Ms. Prieto Díaz, Beatriz

- ♦ Mechanical Engineer at Riegos y Electricidad Salamanca, SL
- ♦ Degree in Mechanical Engineering. University of Salamanca.
- ♦ Master's Degree in Industrial Mechanics. Carlos III University of Madrid



*Get trained at the world's  
leading private Spanish-  
speaking online university"*

04

# Structure and Content

The structure of the contents has been designed by the best professionals in the Mechanical Engineering sector, with extensive experience and recognized prestige in the profession, and aware of the benefits that the latest educational technology can bring to higher education.







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*We have the most complete and up-to-date academic program in the market. We strive for excellence and for you to achieve it too"*

## Module 1. Structures and Installations

- 1.1. Structural Calculations
  - 1.1.1. Beam Calculations
  - 1.1.2. Column Calculations
  - 1.1.3. Frame Calculation
  - 1.1.4. Foundations
  - 1.1.5. Preloaded Structures
- 1.2. Low Voltage Electrical Installations
- 1.3. Heating, Ventilation, and Air Conditioning Installations
  - 1.3.1. Heating Installations
  - 1.3.2. Air Conditioning Installations
  - 1.3.3. Ventilation Installations
- 1.4. Sanitary Water and Sewerage Systems
  - 1.4.1. Water Installations
  - 1.4.2. Hot Water Systems- HWS
  - 1.4.3. Sewer Networks
- 1.5. Fire Safety Installations
  - 1.5.1. Portable Extinguishing Systems
  - 1.5.2. Detection and Alarm Systems
  - 1.5.3. Automatic Extinguishing Systems
  - 1.5.4. Fire Hydrants, Dry Columns, and BIEs
- 1.6. Communication, Home Automation and Security Installations
- 1.7. Thermal and Acoustic Insulation
- 1.8. Steam, Compressed Air and Medical Gases Installations
  - 1.8.1. Steam Installations
  - 1.8.2. Compressed Air Installations
  - 1.8.3. Medical Gas Installations

- 1.9. Gas and Liquid Fuels Installations
  - 1.9.1. Natural Gas Installations
  - 1.9.2. Liquefied Petroleum Gas Installations
  - 1.9.3. Liquid Hydrocarbon Facilities
- 1.10. Energy Certifications
  - 1.10.1. Energy Demand Control
  - 1.10.2. Renewable Energy Contribution
  - 1.10.3. Energy Audits
  - 1.10.4. ISO 50001 Energy Certification

## Module 2. Advanced Dynamics

- 2.1. Advanced Machine Dynamics
- 2.2. Vibrations and Resonance
- 2.3. Longitudinal Vehicle Dynamics
  - 2.3.1. Vehicle Performance
  - 2.3.2. Vehicle Braking
- 2.4. Transverse Vehicle Dynamics
  - 2.4.1. Steering Geometry
  - 2.4.2. Circulation in Curves
- 2.5. Railroad Dynamics
  - 2.5.1. Traction Efforts
  - 2.5.2. Braking Efforts
- 2.6. Dynamics of Mechanical Microsystems
- 2.7. Robot Kinematics
  - 2.7.1. Direct Kinematic Problem
  - 2.7.2. Inverse Kinematic Problem
- 2.8. Robot Dynamics
- 2.9. Biomimicry
- 2.10. Dynamics of Human Movement

**Module 3. Materials**

- 3.1. Material Properties
  - 3.1.1. Mechanical Properties
  - 3.1.2. Electrical Properties
  - 3.1.3. Optical Properties
  - 3.1.4. Magnetic Properties
- 3.2. Metallic Materials I - Ferrous
- 3.3. Metallic Materials II - Non-ferrous
- 3.4. Polymeric Materials
  - 3.4.1. Thermoplastics
  - 3.4.2. Thermosetting Plastics
- 3.5. Ceramic Materials
- 3.6. Composite Materials
- 3.7. Biomaterials
- 3.8. Nanomaterials
- 3.9. Corrosion and Degradation of Materials
  - 3.9.1. Types of Corrosion
  - 3.9.2. Oxidation of Metals
  - 3.9.3. Corrosion Control
- 3.10. Non-Destructive Testing
  - 3.10.1. Visual Inspections and Endoscopies
  - 3.10.2. Ultrasound
  - 3.10.3. X-Rays
  - 3.10.4. Eddy Currents of Foucolt
  - 3.10.5. Magnetic Particles
  - 3.10.6. Penetrating Liquids
  - 3.10.7. Infrared Thermography

**Module 4. Mechanics 4.0**

- 4.1. Introduction to Industry 4.0
- 4.2. Principles of Mechatronics
- 4.3. Sensorization and Detection
  - 4.3.1. Range Detection
  - 4.3.2. Proximity Detection
  - 4.3.3. Contact Sensors
  - 4.3.4. Force Detection
- 4.4. Actuators
- 4.5. Control Systems
- 4.6. Computer Vision
  - 4.6.1. Vision Sensors
  - 4.6.2. Integrated Vision Systems
  - 4.6.3. Advanced Vision Systems
- 4.7. Digital Twins
- 4.8. The Internet of Things
  - 4.8.1. Hardware
  - 4.8.2. Software and Connectivity
  - 4.8.3. Rules
  - 4.8.4. Services
- 4.9. *Cloud Computing and Big Data*
  - 4.9.1. Storage Technology
  - 4.9.2. Analysis Techniques
- 4.10. Machine Learning and Artificial Intelligence

05

# Methodology

This training program provides you with a different way of learning. Our methodology uses a cyclical learning approach: ***Re-learning***.

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 Re-learning, 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 you a revolutionary approach to developing your skills and knowledge. Our goal is to strengthen your skills in a changing, competitive, and highly demanding environment.

“

*With TECH you can 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*



### A learning method that is different and innovative.

This Intensive Engineering Program at TECH prepares 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 you will use the Harvard case studies, with which we have a strategic agreement that allows us, to offer you material from the best university world.

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*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.

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

## Re-Learning 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 teaching elements in each lesson.

We enhance Harvard case studies with the best 100% online teaching method: Re-learning.

*In 2019 we obtained the best learning results of all Spanish-language 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 Re-learning.

Our University is the only one in Spanish-speaking countries licensed to incorporate 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 Spanish 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.

With this methodology we have 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, markets, and financial 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.

*Re-learning 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 to success*

Based on the latest evidence in neuroscience, not only do we know how to organize information, ideas, images, memories, but we also know that the place and context where we have learned something is crucial for us to be able to remember it and store it in the hippocampus, and 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.



In this program you will have access to the best educational material, prepared with you 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 our future difficult decisions.



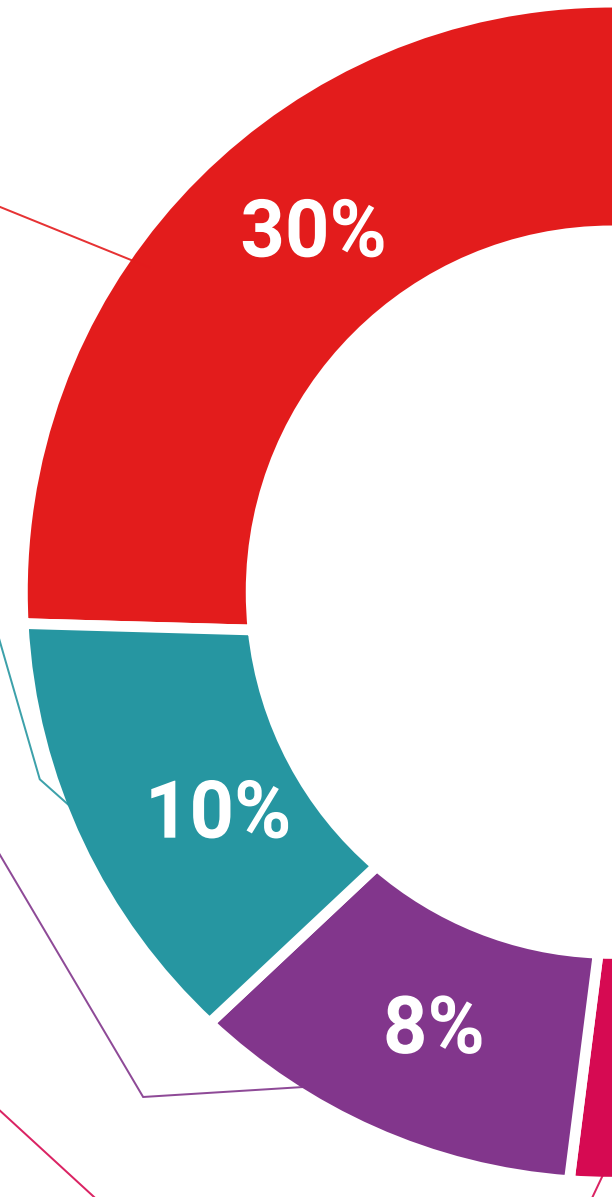
#### Practising Skills and Abilities

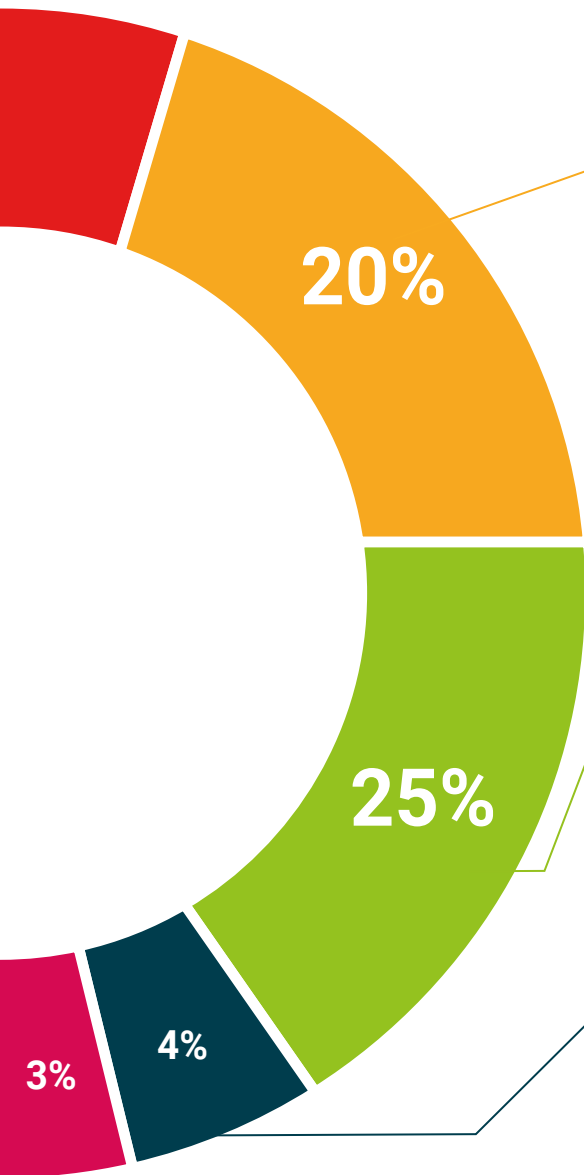
They will carry out activities to develop specific competencies and skills in each thematic area. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop in the context of the globalization we live in.



#### Additional Reading

Recent articles, consensus documents, international guides... in TECH's virtual library the student will have access to everything they need to complete their training.





#### Case Studies

You 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 Latin America.



#### Interactive Summaries

The TECH team presents the contents in an attractive and dynamic way in multimedia packages 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 & Re-testing

The student's knowledge is periodically assessed and re-assessed throughout the program, through evaluative and self-evaluative activities and exercises: in this way, students can check how they are doing in terms of achieving their goals.



06

# Certificate

The Postgraduate Diploma in Structures, Materials and Dynamics in Mechanical Engineering guarantees, in addition to the most rigorous and up-to-date training, access to a Postgraduate Diploma issued by TECH Global University.





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*Successfully complete this training program  
and receive your Postgraduate Diploma without  
travel or laborious paperwork"*

This program will allow you to obtain your **Postgraduate Diploma in Structures, Materials and Dynamics in Mechanical Engineering** 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.

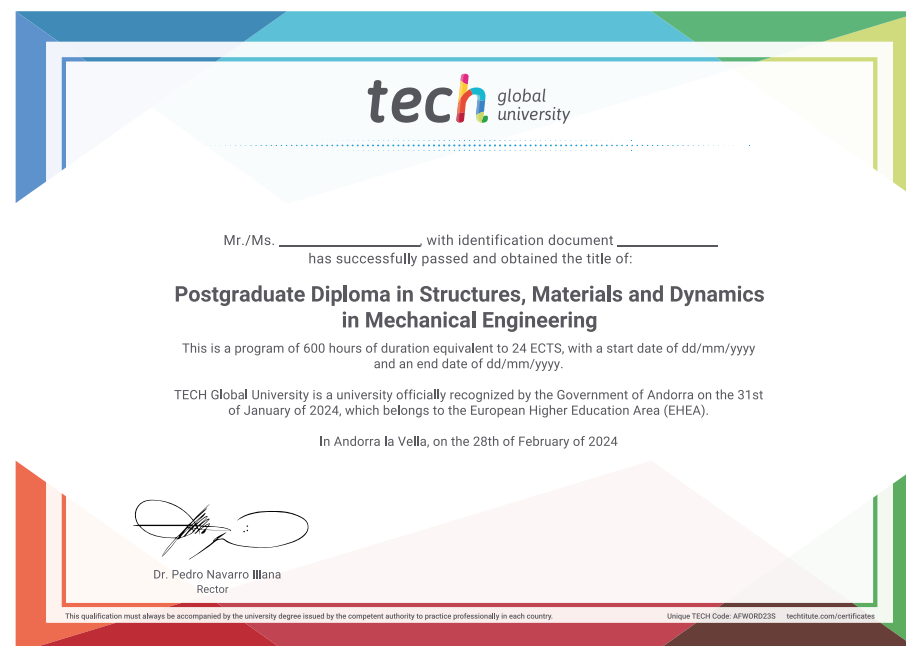
This **TECH Global University** title is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Postgraduate Diploma in Structures, Materials and Dynamics in Mechanical Engineering**

Modality: **online**

Duration: **6 months**

Accreditation: **24 ECTS**



future  
health confidence people  
education information tutors  
guarantee accreditation teaching  
institutions technology learning  
community commitment  
personalized service innovation  
knowledge present quality  
online training  
development language  
classroom



## Postgraduate Diploma Structures, Materials and Dynamics in Mechanical Engineering

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Structures, Materials and Dynamics in  
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