

# Postgraduate Certificate

## Laboratory Characterization Techniques for Construction Materials



## Postgraduate Certificate Laboratory Characterization Techniques for Construction Materials

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

Website: [www.techtute.com/us/engineering/postgraduate-certificate/laboratory-characterization-techniques-construction-materials](http://www.techtute.com/us/engineering/postgraduate-certificate/laboratory-characterization-techniques-construction-materials)

# Index

01

Introduction

---

*p. 4*

02

Objectives

---

*p. 8*

03

Course Management

---

*p. 12*

04

Structure and Content

---

*p. 18*

05

Methodology

---

*p. 22*

06

Certificate

---

*p. 30*

# 01

# Introduction

To ensure the highest quality in the design and manufacture of buildings, the morphological and functional properties of certain substances must be studied. The above is intended to provide the most important information about these compounds, such as strength and reliability. This program will address the tools necessary to identify, select and make use of the most powerful and versatile characterization techniques available today to determine the composition, topography, morphology and properties of materials and surfaces.







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*Perform an in-depth breakdown of the various techniques and equipment used to chemically, mineralogically and petrophysically characterize a building material"*

The technological experiments used in industry to determine the strength and durability of materials are very varied and necessary. Performing these analyses facilitates the characterization of the physical, chemical and mechanical properties of the raw materials used in the construction sector. This is essential to foresee the useful life of the products based on the environmental conditions to which they will be exposed.

This Postgraduate Certificate in Laboratory Characterization Techniques for Construction Materials will address the tools necessary to identify, select and make use of the most powerful and versatile characterization techniques available today to determine the composition, topography, morphology and properties of materials and surfaces.

In each class, information on microscopy such as optics, Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), among others, will be taught. Likewise, classes related to X-ray diffraction will be given so that the student will be able to identify the phases present in a material. In addition, X-ray fluorescence contents will be taught, which will help students gain in-depth knowledge of the elements that make up the materials.

A module will be devoted to the techniques, underlying physics and geometry, instrumental aspects, practical use, and the benefits and problems related to their application in materials science. At the end of the program, the engineer will have practical knowledge of how to apply the above techniques in the development of materials. This will enable them to use the appropriate methodology for a given material to be characterized and to be able to interpret the data and extract the necessary information.

With a 100% online Postgraduate Certificate students will be able to study comfortably, wherever and whenever they want. All you need is a device with internet access to take your career one step further. A modality according to the current times with all the guarantees to position the engineer in a highly demanded sector.

This **Postgraduate Certificate in Laboratory Characterization Techniques for Construction Materials** contains the most complete and up-to-date program on the market. The most important features of the program include:

- ◆ Gain in-depth knowledge of the variables, analysis and processing methods, as well as the characterization and properties of the materials used in construction
- ◆ Determine the life cycle and the carbon footprint of the materials
- ◆ Experiment with new materials and technology related to new applications and uses
- ◆ Manage new building technologies and participate in building quality management processes
- ◆ Evaluate aspects of sustainability and environmental impact of the materials
- ◆ Analyze the concept of durability of the construction materials and their relationship with the concept of sustainability
- ◆ Identify the main causes of the alteration of construction materials



*Apply the latest systems and technology for the rehabilitation of a construction project and the maintenance of old buildings”*

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*Study this Postgraduate Certificate  
100% online at a time to suit you  
no matter where you are"*

*Master the evaluation and interpretation of  
the data obtained from the characterization  
procedures in order to choose the materials  
best suited to the construction project.*

*Take your career to the next level  
by making proposals for materials  
based on scientific data.*

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

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

The design of this program focuses on Problem-Based Learning, which means the student must try to solve the different real-life situations of that arise throughout the academic program. For this purpose, the professional will be assisted by an innovative interactive video system created by renowned and experienced experts.



# 02 Objectives

The design of this Postgraduate Certificate will allow the student to acquire new competencies and skills that are necessary to update their knowledge and skills in their profession. The knowledge gained in this program will enable them to gain understanding of the tools needed to identify, select and make use of the most powerful and versatile characterization techniques available today. In view of the above, TECH establishes the following general and specific objectives to guarantee the satisfaction of the future graduate.





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*Apply appropriate techniques to determine the composition, topography, morphology and properties of materials and surfaces”*



## General Objectives

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- ◆ Perform an exhaustive analysis of the different types of construction materials
- ◆ Gain in-depth knowledge of the features of different construction materials
- ◆ Implement new technologies applied to engineering materials
- ◆ Assess the waste materials
- ◆ Manage materials from a quality and production point of view
- ◆ Apply new techniques in making construction materials that are more environmentally friendly
- ◆ Raise awareness of new trends and materials applied to construction





## Specific Objectives

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- ◆ Give an in-depth breakdown of the various techniques and equipment used to chemically, mineralogically and petrophysically characterize a construction material
- ◆ Establish the basis for advanced materials characterization techniques, specifically optical microscopy, scanning electron microscopy, transmission electron microscopy, x-ray diffraction, x-ray fluorescence, etc.
- ◆ Master the evaluation and interpretation of data obtained with scientific techniques and procedures

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*Learn about the X-ray diffraction technique so that you will be able to identify the phases present in a material”*



03

# Course Management

In our commitment to offer elite education for all, TECH works with renowned professionals so that the student acquires solid knowledge of the laboratory characterization techniques for construction materials. For this reason, this Postgraduate Certificate has a highly qualified team with extensive experience in the sector, who will offer the best possible resources to help students develop their skills throughout the course.







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*Understand the laboratory techniques used in characterization tests of different materials and position yourself as a expert in a highly-demanded field”*

## Management



### Dr. Miñano Belmonte, Isabel de la Paz

- ◆ Contracted Doctor for the Advanced Construction Science and Technology Group of the Polytechnic University of Cartagena
- ◆ Technical Architect from the Polytechnic University of Cartagena
- ◆ Construction Engineer from the Camilo José Cela University
- ◆ PhD from the Polytechnic University of Cartagena
- ◆ Master's Degree in Construction (Major in Technology) from the Polytechnic University of Valencia
- ◆ Speaker at various national and international conferences and congresses
- ◆ Author of the books "*Manual de cálculo de hormigón armado. Teoría y ejemplos prácticos*" (Reinforced concrete calculation manual. Theory and practical examples) and "*Problemas resueltos de hormigón armado (HA)*" (Solved problems of reinforced concrete), as well as author of specific chapters in other books
- ◆ Co-author of various scientific high-impact publications on construction materials

## Professors

### Mr. del Pozo Martín, Jorge

- ◆ Technical and economic evaluator and project auditor at the Spanish Ministry of Science and Innovation
- ◆ Civil Engineer
- ◆ Diploma in Business Administration from UNED In his professional work experience, he worked in the private sector in Arthur Andersen, Pacadar, Dragados and Bovis Lend Lease
- ◆ Master's Degree in Research in Civil Engineering from the University of Cantabria

### Dr. Muñoz Sánchez, María Belén

- ◆ Consultant in Innovation and Sustainability of Construction Materials
- ◆ Reseracher in polymers at POLYMAT
- ◆ Dr. Engineer of Sustainable Processes and Materials from the University of the Basque Country
- ◆ Chemical Engineer from the University of Extremadura
- ◆ Master's Degree in Research, with a major in Chemistry from the University of Extremadura

- ◆ Extensive experience in R&D&I in materials, including waste valorization to create innovative construction materials
- ◆ Co-author of scientific article published in international journals
- ◆ Speaker at international congresses related to renewable energies and the environmental sector



*You will have access to a library of multimedia resources 7 days a week, 24 hours a day”*

# 04

## Structure and Content

The syllabus has been designed to meet the essential requirements that help engineers learn about construction materials that have been developed following the latest technological and environmental trends. In addition, thanks to the proposals of the teaching team, it has the necessary structure to offer a broad perspective in this field. All of this to implement the tools and techniques that help professionals to select the best materials in their work projects. From the first class, students will see their knowledge broadened, allowing them to learn through practical and theoretical content.







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*Become a professional with scientific knowledge by applying the techniques that allow you to know the composition of materials and surfaces”*

## Module 1. Microstructural Characterization of Materials

- 1.1. Optical Microscope
  - 1.1.1. Advanced Optic Microscope Techniques
  - 1.1.2. Principles of the Technique
  - 1.1.3. Topography and Application
- 1.2. Transmission Electron Microscopy (TEM)
  - 1.2.1. TEM Structure
  - 1.2.2. Electron Diffraction
  - 1.2.3. TEM Images
- 1.3. Scanning Electron Microscope (SEM)
  - 1.3.1. SEM Characteristics
  - 1.3.2. Microanalysis of X Rays
  - 1.3.3. Advantages and Disadvantages
- 1.4. Scanning Transmission Electron Microscopy (STEM)
  - 1.4.1. STEM
  - 1.4.2. Images and Tomography
  - 1.4.3. EELS
- 1.5. Atomic Force Microscopy (AFM)
  - 1.5.1. AFM
  - 1.5.2. Topographic Modes
  - 1.5.3. Electric and Magnetic Characterization of Samples
- 1.6. Mercury Intrusion Porosimetry Hg
  - 1.6.1. Porosity and Porous System
  - 1.6.2. Equipment and Properties
  - 1.6.3. Analysis
- 1.7. Nitrogen Porosimetry
  - 1.7.1. Description of the Equipment
  - 1.7.2. Properties
  - 1.7.3. Analysis
- 1.8. X Ray Diffraction (XRD)
  - 1.8.1. Generation and Characteristics of XRD
  - 1.8.2. Sample Preparation
  - 1.8.3. Analysis





- 1.9. Electrical Impedance Spectroscopy (EIE)
  - 1.9.1. Method
  - 1.9.2. Procedure
  - 1.9.3. Advantages and Disadvantages
- 1.10. Other Interesting Techniques
  - 1.10.1. Thermogravimetry
  - 1.10.2. Fluorescence
  - 1.10.3. Absorption Isothermal Desorption of H<sub>2</sub>O Vapor

“ Choose the perfect program for your professional career and develop your scientific and analytical skills”



05

# Methodology

This training program offers a different way of learning. Our methodology uses a cyclical learning approach: **Relearning**.

This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.







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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"*

## At TECH we use the Case Method

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

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



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



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

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

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

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

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

What should a professional do in a given situation? This is the question that you are presented with in the case method, an action-oriented learning method. Throughout the program, the studies will be presented with multiple real cases.

They will have to combine all their knowledge and research, and argue and defend their ideas and decisions.

## Relearning Methodology

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

We enhance Harvard case studies with the best 100% online teaching method: Relearning.

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

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

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





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

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

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

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

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



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



#### Study Material

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

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



#### Classes

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



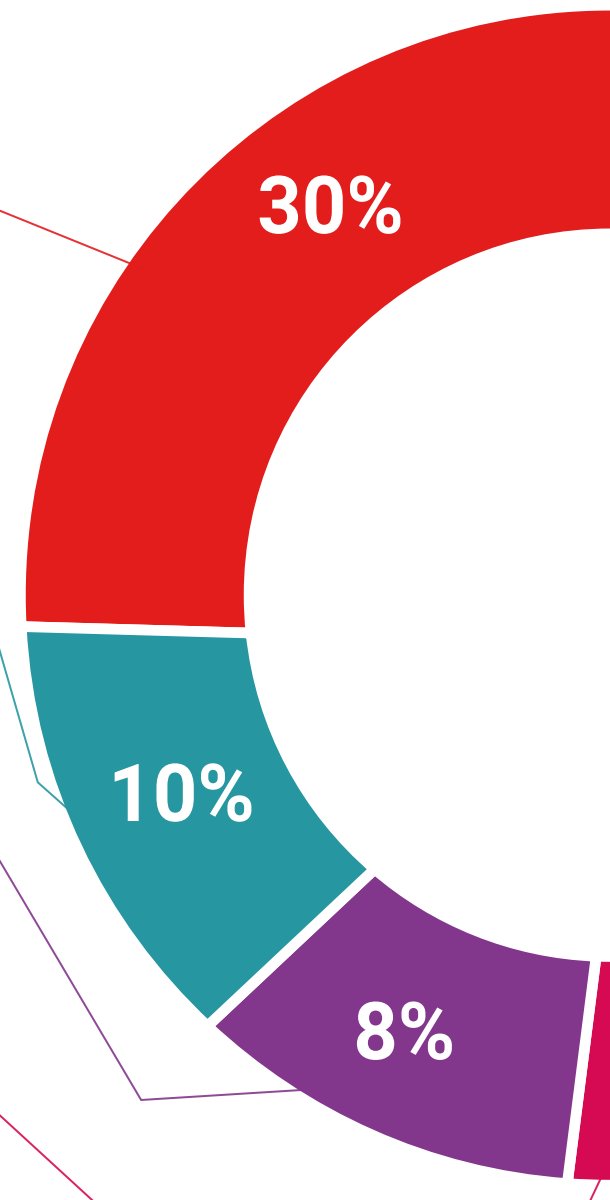
#### Practising Skills and Abilities

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



#### Additional Reading

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





**Case Studies**

They will complete a selection of the best case studies in the field used at Harvard. Cases that are presented, analyzed, and supervised by the best senior management specialists in the world.



**Interactive Summaries**

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

This exclusive multimedia content presentation training Exclusive system was awarded by Microsoft as a "European Success Story".



**Testing & Retesting**

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





# 06 Certificate

The Postgraduate Certificate in Laboratory Characterization Techniques for Construction Materials guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Global University.





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*Successfully complete this training  
and receive your university degree  
without travel or laborious paperwork”*

This program will allow you to obtain your **Postgraduate Certificate in Laboratory Characterization Techniques for Construction Materials** 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 Laboratory Characterization Techniques for Construction Materials**

Modality: **online**

Duration: **6 weeks**

Accreditation: **6 ECTS**



\*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.

future  
health confidence people  
education information tutors  
guarantee accreditation teaching  
institutions technology learning  
community commitment  
personalized service innovation  
knowledge presentation  
development large  
classroom



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Laboratory Characterization  
Techniques for Construction  
Materials

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- » Credits: **6 ECTS**
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