

# Postgraduate Certificate

Seismicity Mechanics of the Continuous Medium and Constitutive Models Applied to Geotechnical Engineering



## Postgraduate Certificate Seismicity Mechanics of the Continuous Medium and Constitutive Models Applied to Geotechnical Engineering

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

Website: [www.techtitute.com/us/engineering/postgraduate-certificate/seismicity-mechanics-continous-medium-constitutive-models-applied-geotechnical-engineering](http://www.techtitute.com/us/engineering/postgraduate-certificate/seismicity-mechanics-continous-medium-constitutive-models-applied-geotechnical-engineering)

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# 01

# Introduction

Seismic disturbances represent one of the major drawbacks for structures that every professional must consider, both in design and construction. The dynamic response of the ground and its interface with the structure, as well as the damage that may occur to structural and nonstructural elements, depend not only on the characteristics of the seismic action, but also on the behavior of the entire structural system. Therefore, this Postgraduate Certificate was created with the purpose of deepening in the calculation of structural elements, which involve an increase of solicitation and the need to make technical and design modifications in elements to be built in the presence of seismic disturbances, as a change in the mechanics of the continuous soil.





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*Only with proper training will the engineer be able to grow in their career and position themselves as a prestigious professional”*

The Postgraduate Certificate in Seismicity Mechanics of the Continuous Medium and Constitutive Models Applied to Geotechnics is academically designed to provide a deep knowledge, starting from advanced concepts already acquired in the world of civil engineering and from a practical application point of view, of the most important geotechnical aspects that can be found in different types of civil works.

The content ranges from the specific behavior of soils and rocks, with a constant differentiation of both types of terrain throughout all the topics, to their direct application in foundations and structures.

During the training, one of the most significant and most influential aspects in the calculation of structural elements, which involves an increase in stress and the need to make technical and design modifications in elements to be built, is the presence of seismic disturbances, as a change in the mechanics of the continuous soil.

Seismic disturbances represent one of the major drawbacks for structures that every professional must consider, both in design and construction. The dynamic response of the ground and its interface with the structure, as well as the damage that may occur to structural and nonstructural elements, depend not only on the characteristics of the seismic action, but also on the behavior of the entire structural system.

For all these reasons, the Postgraduate Certificate in Seismicity Mechanics of the Continuous Medium and Constitutive Models Applied to Geotechnics integrates the most complete and innovative educational program in the current market in terms of knowledge and latest available technologies, as well as encompassing all the sectors or parties involved in this field. In addition, the Postgraduate Certificate consists of exercises based on real cases of situations currently managed or previously faced by the teaching team.

All this, along a 100% online training that provides the student with the ease of being able to take it wherever and whenever they want. All you need is a device with internet access, and you will be able to access a universe of knowledge that will be the main asset of the engineer when positioning themselves in a sector that is increasingly in demand by companies in various sectors.

This **Postgraduate Certificate in Seismicity Mechanics of the Continuous Medium and Constitutive Models Applied to Geotechnical Engineering** contains the most complete and updated educational program in the market. The most important features of the program include:

- ◆ The development of practical cases presented in Courses in Civil and Geotechnical Engineering
- ◆ 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 the self-assessment process can be carried out to improve learning
- ◆ Its special emphasis on innovative methodologies
- ◆ Theoretical lessons, questions to the course, discussion forums on controversial issues and individual reflection papers.
- ◆ Content that is accessible from any fixed or portable device with an Internet connection



*This very complete Postgraduate Certificate that Tech puts in your hands will allow you to acquire deep competences in mechanical seismicity of the continuous medium and will allow you to grow personally and professionally"*

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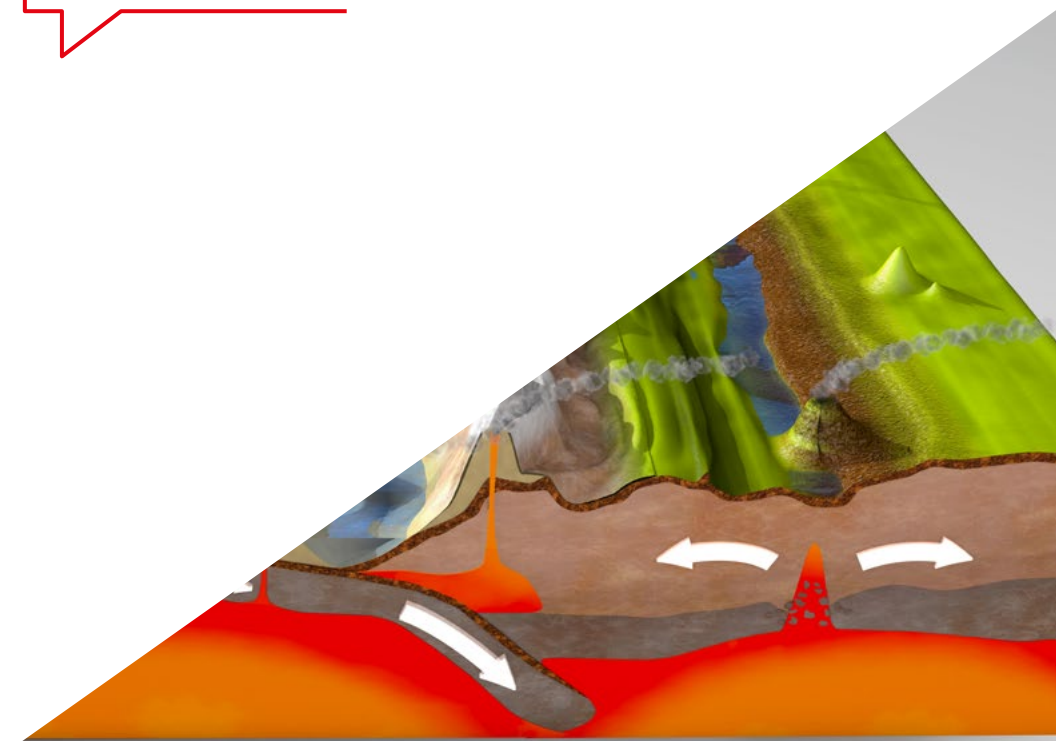
*You will be provided with innovative teaching materials and resources that will facilitate the learning process and the retention of the contents learned for a longer period of time"*

*A 100% online training that will allow you to combine your studies with the rest of your daily activities*

The program's teaching staff includes professionals from the 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.

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 engineers.



# 02

# Objectives

TECH has designed this comprehensive Postgraduate Certificate with the aim of training engineering professionals to be able to design, implement and work on Civil Works, knowing everything related to this industry and technical and professional aspects at the national and international level that directly affect it. To this end, specific aspects of the profession that stand out for their enormous importance in today's business landscape will be addressed, and for which large corporations are increasingly demanding competent engineers with a solid specialized training.







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*TECH pursues only one goal with its Training: to catapult students towards professional success”*



## General Objectives

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- ◆ Delve deeper into kinds of grounds, not only in their typology but also in their behavior Not only in the evident differentiation of stresses and deformations of soils and rocks, but also under particular but very common conditions, such as the presence of water or seismic disturbances
- ◆ Efficiently recognize the needs for soil characterization, being able to design campaigns with the optimal means for each type of structure, optimizing and giving added value to the study of materials
- ◆ Identify the behavior of slopes and semi-subterranean structures such as foundations or walls in their different typologies This complete identification must be based on understanding and being able to anticipate the behavior of the terrain, the structure and its interface Know in detail the possible faults that each set can produce and as a consequence have a deep understanding of the repair operations or improvement of materials to mitigate damage
- ◆ Receive a complete tour of tunnel and gallery excavation methodologies, analyzing all drilling procedures, design constraints, support and lining





## Specific Objectives

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- ◆ Identify the effects induced in the ground by seismic action, as part of the non-linear behavior of the ground
- ◆ Deepen in the particularities of the terrain, discretizing between soils and rocks, and of the instantaneous behavior under seismic loads
- ◆ Analyze the most important regulations in the field of seismic, especially in areas of the planet where earthquakes are frequent and of significant magnitude
- ◆ Analyze the changes that the seismic action produces in the identifying parameters of the terrain and to observe how they evolve depending on the type of seismic action
- ◆ Delve into the different practical methodologies for the analysis of ground behavior under seismic conditions Both semi-empirical simulations as well as complex finite element modeling
- ◆ Quantify the impact of seismic disturbances on foundations, both in terms of their definition in the design and final sizing.
- ◆ Apply all a these conditions to both shallow and deep foundations
- ◆ Perform a sensitivity analysis of the above-mentioned behaviors in containment structures and in the most common elements of subway excavations
- ◆ Apply the study of seismic wave disturbances to other elements that can propagate along the ground, such as the study of noise and vibration transmission in the ground



03

# Course Management

TECH applies a criterion based on high quality in all its training. This guarantees students that by studying here they will find the best didactic content taught by the best professionals in the sector. In this sense, this Postgraduate Certificate in Seismicity Mechanics of the Continuous Medium and Constitutive Models Applied to Geotechnical Engineering counts on highly prestigious professionals in this field, who bring to the training the experience of their years of work, as well as the knowledge acquired from research in the field. All to provide the engineer with a high-level program, which will enable them to practice in national and international environments with greater guarantees of success.



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*The best teachers are at the best university. Don't miss this great opportunity to be trained by the best experts in the sector"*

## Management



### Mr. Estébanez Aldona, Alfonso

- ◆ Civil Engineer graduated from the Polytechnic University of Madrid
- ◆ Studying the E.T.S.I. Ph.D Roads, Canals and Ports U.P.M. in the Department of Terrain Engineering.
- ◆ Course of Health and Safety Coordinator in Construction Works registered by the CAM nº 3508
- ◆ Engineering and Technical Director at ALFESTAL
- ◆ International Consultant and Project Manager at D2
- ◆ Project Manager in the Department of Tunnels and Underground Works in Inarsa S.A
- ◆ Assistant Technician in the Geology and Geotechnical Department of Intecsa-Inarsa

## Professors

### Mr. Sandin Sainz-Ezquerro, Juan Carlos

- ◆ Specialist in the calculation of structures and foundations, fields in which he has developed his entire professional career over the last 25 years
- ◆ Civil Engineer graduated the ETSI of, Canals and Ports from the Polytechnic University of Madrid (U.P.M.).
- ◆ Studying the E.T.S.I. Ph.D Roads, Canals and Ports U.P.M. in the Structures Department
- ◆ Course on integration of BIM technology in structural design 2017
- ◆ Lecturer in the BIM Master developed at the Colegio de Caminos 2019
- ◆ Technical assistance for SOFISTIK AG for Spain and Latin America, finite element modeling software for terrain and structures

### Mr. Clemente Sacristan, Carlos

- ◆ Civil Engineer graduated from the Polytechnic University of Madrid
- ◆ Development of large-scale linear works for different administrations (ADIF, Ministry of Public Works, Provincial Council of Vitoria...) being a reference project manager in the field of linear works.
- ◆ Executive at BALGORZA S.A.
- ◆ Occupational risk prevention course for construction company managers
- ◆ Advanced course in management of large turnkey projects (EPC)

### Ms. Lope Martín, Raquel

- ◆ Geological Engineer Complutense University of Madrid UCM
- ◆ PROINTEC's technical department has been involved in various projects requiring improvement treatments, both nationally and internationally: jet grouting, gravel columns, vertical drainage, etc.
- ◆ Course on Geotechnics Applied to Building Foundations
- ◆ Course on Technical Control for Property and Casualty Insurance Geotechnics, foundations and structures

04

# Structure and Content

The syllabus of the Postgraduate Certificate is structured as a comprehensive tour through each and every one of the concepts required to understand and work in this field. Thus, through a novel didactic approach, based on the practical application of the contents, the engineer will learn and understand the functioning of geotechnics and foundations, knowing how to design and implement projects in this sense, providing high safety indexes and services to the companies. This, in addition to adding value to your professional profile, will make you a much better prepared professional to work in a variety of environments.





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*We have you the largest content library in the industry. It has been specially designed to give your career the boost it needs”*

**Module 1:** Seismicity Mechanics of the Continuous Medium and Constitutive Models Application to Soil and Rocks

- 1.1. Seismic Response of Soils
  - 1.1.1. Seismic Effect in Soils
  - 1.1.2. Non-linear Behaviour in Soils
  - 1.1.3. Induced Effects Due to Seismic Action
- 1.2. Seismic Study in Regulations
  - 1.2.1. Properties of Seismic Regulations
  - 1.2.2. Interaction Between International Standards
  - 1.2.3. Comparison of Parameters and Validations
- 1.3. Estimated Ground Motion under Seismic Conditions
  - 1.3.1. Predominant Frequency in a Stratum
  - 1.3.2. Jake's Thrust Theory
  - 1.3.3. Nakamura Simulation
- 1.4. Earthquake Simulation and Modeling.
  - 1.4.1. Semiempirical Formulas
  - 1.4.2. Simulations in Finite Element Modeling
  - 1.4.3. Analysis of Results
- 1.5. Seismicity in Foundations and Structures
  - 1.5.1. Modulus of Elasticity in Earthquakes
  - 1.5.2. Variation in the Stress-strain Relationship
  - 1.5.3. Specific Rules for Piles
- 1.6. Seismicity in Excavations
  - 1.6.1. Influence of Earthquakes on Earth Pressure
  - 1.6.2. Typologies of Equilibrium Losses in Earthquakes
  - 1.6.3. Measures for Control and Improvement of Excavation in Earthquakes
- 1.7. Site Studies and Seismic Hazard Calculations
  - 1.7.1. General Criteria of Design
  - 1.7.2. Seismic Danger in Structures
  - 1.7.3. Special Seismic Construction Systems for Foundations and Structures





- 1.8. Liquefaction in Saturated Granular Soils
  - 1.8.1. Liquefaction Phenomenon
  - 1.8.2. Reliability of Calculations Against Liquefaction
  - 1.8.3. Evolution of Parameters in Liquefactive Soils
- 1.9. Seismic Resilience in Soils and Rocks
  - 1.9.1. Fragility Curves
  - 1.9.2. Seismic Risk Calculations
  - 1.9.3. Estimation of Soil Resistance
- 1.10. Transmission of Other Types of Waves in the Field Sound Through Ground
  - 1.10.1. Vibrations Present in the Ground
  - 1.10.2. Transmission of Waves and Vibrations in Different Types of Soil
  - 1.10.3. Disturbance Transmission Modeling



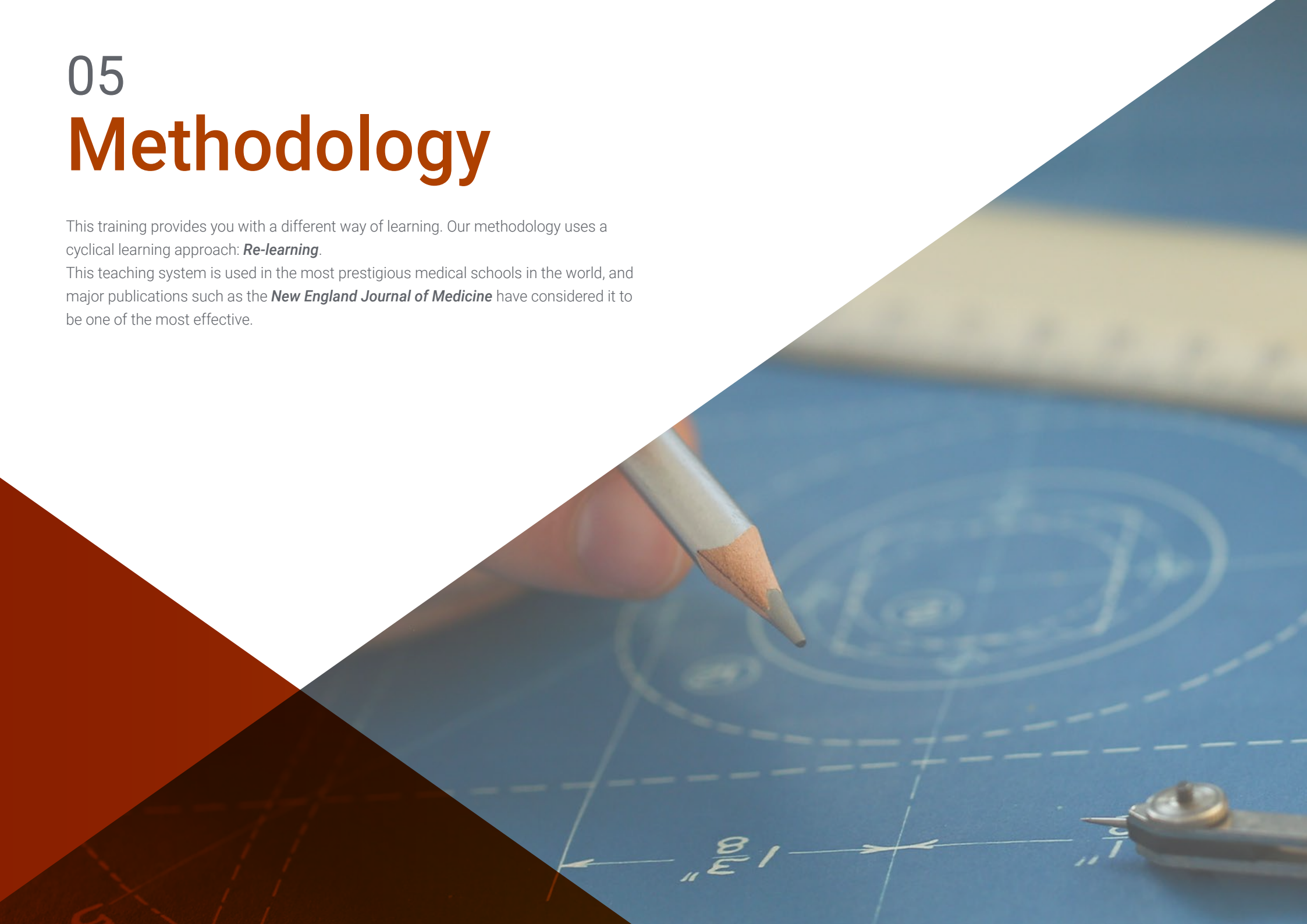
*This training will allow you to advance in your career in a seamless way”*

05

# Methodology

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

This teaching system is used 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 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.

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*With TECH you can experience a way of learning that is shaking the foundations of traditional universities around the world”*



*Our school is the first in the world 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 Engineering program at TECH- Technological University is an intensive program that prepares you to face all the challenges in this area, both nationally and internationally. The main objective is to promote your personal and professional growth. For this purpose, we rely on the case studies of Harvard Business School, with which we have a strategic agreement that allows us to use the materials used in the most prestigious university in the world: HARVARD.

“ We are the only online university that offers Harvard materials as teaching materials on its courses”

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

The case method has been the most widely used learning system among the world's leading business schools for as long as they have existed. 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.

In a given situation, what would you do? This is the question that you are presented with in the case method, an action-oriented learning method. Throughout the course, you will be presented with multiple real cases. You will have to combine all your knowledge, and research, argue, and defend your ideas and decisions.

## Re-Learning Methodology

Our University is the first in the world to combine Harvard University case studies with a 100%-online learning system based on repetition, which combines 16 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 (we learn, unlearn, forget, and re-learn). Therefore, we combine each of these elements concentrically.

With this methodology we have 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, 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.

This content is then adapted in an audiovisual format that will create our way of working online, with the latest techniques that allow us to offer you high quality in all of the material that we provide you with.



### 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

You 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 we live in.



### Additional Reading

Recent articles, consensus documents, international guides... in our virtual library you will have access to everything you need to complete your Update.





### 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

We present the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

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



### Testing & Re-testing

We periodically evaluate and re-evaluate your knowledge throughout the program. We do this on 3 of the 4 levels of Miller's Pyramid.



# 06

# Certificate

Through a different and stimulating learning experience, you will be able to acquire the necessary skills to take a big step in your training.

An opportunity to progress, with the support and monitoring of a modern and specialized university, which will propel you to another professional level.



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*Include in your training a Postgraduate Certificate in Seismicity Mechanics of the Continuous Medium and Constitutive Models Applied to Geotechnical Engineering: a highly qualified added value for any professional in this area"*

This private qualification will allow you to obtain an **Postgraduate Certificate in Seismicity Mechanics of the Continuous Medium and Constitutive Models Applied to Geotechnical 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** private qualification, 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 Seismicity Mechanics of the Continuous Medium and Constitutive Models Applied to Geotechnical Engineering**

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 **tech** technological university

community commitment

personalized service innovation

knowledge present  
online training

development language

classroom

## Postgraduate Certificate Seismicity Mechanics of the Continuous Medium and Constitutive Models Applied to Geotechnical Engineering

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

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