

# Postgraduate Certificate

## Geotechnics Applied to Tunneling and Mining Excavations



## Postgraduate Certificate Geotechnics Applied to Tunneling and Mining Excavations

- » Modality: **online**
- » Duration: **6 weeks**
- » Certificate: **TECH Technological University**
- » Dedication: **16h/week**
- » Schedule: **at your own pace**
- » Exams: **online**

Website: [www.techtute.com/in/engineering/postgraduate-certificate/geotechnics-applied-tunneling-mining-excavations](http://www.techtute.com/in/engineering/postgraduate-certificate/geotechnics-applied-tunneling-mining-excavations)

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# 01

# Introduction

During the course of this program, students will learn all about the application and construction of mining tunnels and galleries, as well as the intersections between them and the interaction with the elements already built, such as the influence of such excavations on the surface or with other previous constructions. Their different applications and the suitability of each one will be analyzed, depending on the conditions of the terrain to be treated and the work to be carried out. These contents will allow the professional to carry out an original and application-oriented analysis of the theoretical concepts developed throughout the Postgraduate Certificate, in such a way that they will unequivocally become a much more capable and sought-after professional.







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*Thanks to this complete Postgraduate Certificate you will learn about the latest developments in geotechnics applied to tunnels and mining, and you will grow in your profession"*

The Postgraduate Certificate in Geotechnics Applied to Tunnel Excavations and Mining is academically designed to provide in-depth knowledge, based on 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.

In terms of content, this Postgraduate Certificate is dedicated to a very important part of geotechnical engineering such as deep excavation, i.e. tunnels and mining excavations.

This aspect is so extensive that it will be developed throughout the program, as well as a tour of the methodologies, calculation criteria and the particularities that the excavation of both tunnels and mining galleries implies.

This tour is carried out for the different means of excavation, referring to the machinery itself, the methodology itself, the suitability of the land and the diameters of the excavations with the same, as well as the excavability of soils and rocks, corresponding to these modes of excavation.

The application of tunnels and mining galleries, the intersections between them and the interaction with the elements already built, such as the influence of such excavations on the surface or with other previous constructions, are elements of this module.

Consequently, the Postgraduate Certificate in Geotechnics Applied to Tunnel Excavations and Mining integrates the most complete and innovative educational program in the current market in terms of knowledge and latest technologies available, 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.

The **Postgraduate Certificate in Geotechnics Applied to Tunneling and Mining Excavations** contains the scientific most complete and up-to-date Educational program on 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.
- » Access to content from any fixed or portable device with an Internet connection.



*Apply the latest advances in this field and give your curriculum a boost of value thanks to this very complete Postgraduate Certificate from TECH"*



*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"*

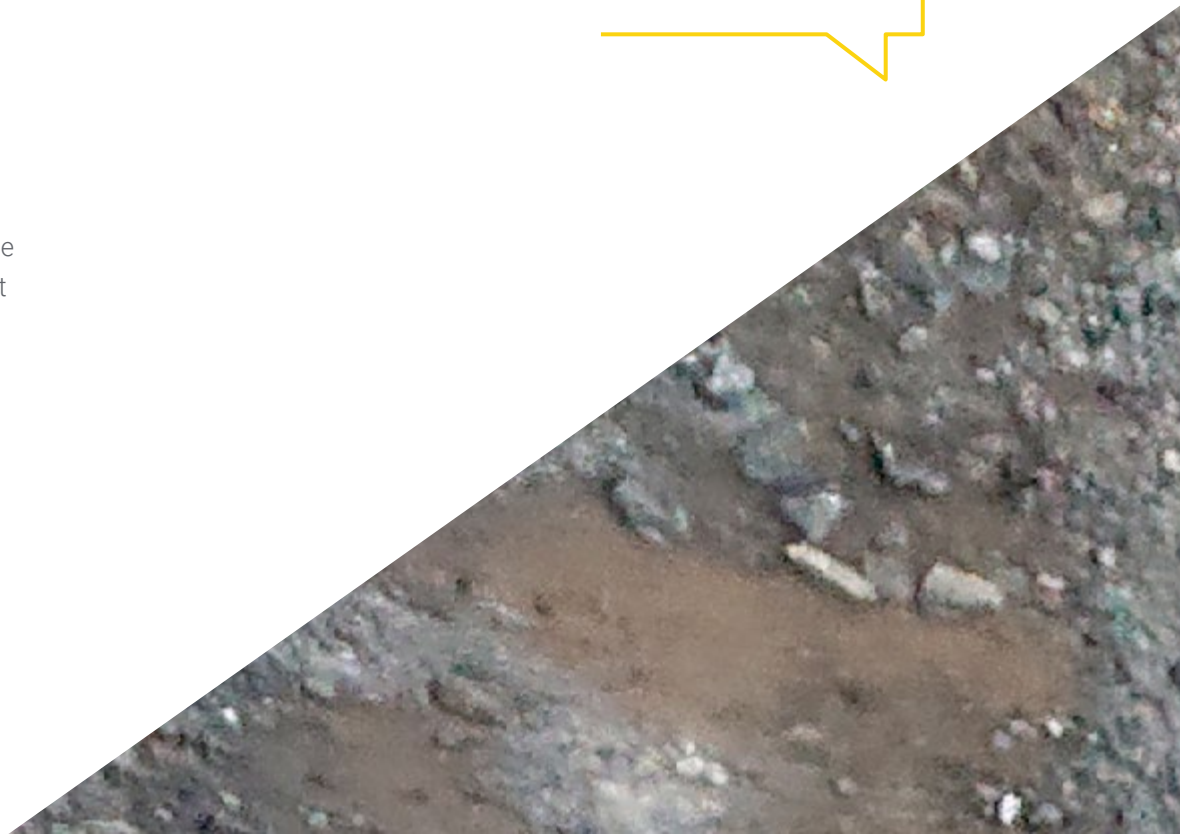
The program's teaching staff includes professionals from the sector who contribute their work experience to this training program, as well as renowned specialists from leading societies and prestigious universities.

The multimedia content, developed with the latest educational technology, will provide professionals with situated and contextual learning, i.e., a simulated environment that will provide immersive program, designed for training oneself 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.

*Only with the right training, the engineer will be able to grow within an industry that increasingly demands more expert professionals*

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





# 02

# Objectives

TECH has designed this Postgraduate Certificate with the aim to train engineering professionals to be able to design, implement and work in civil works, knowing in depth everything related to the geotechnical characteristics of the land on which you want to act, the characteristics of the same, its current state, or its expected long-term behavior. 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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*Don't miss this great opportunity that will allow you to grow and position yourself as a prestigious engineer"*





## 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



*A training designed based on practical cases that will teach you how to act in real situations in the daily practice of your profession"*







## Specific Objectives

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- » Establish the different most common methodologies for tunnel excavation, both those excavated by conventional methods and those excavated by mechanical means
- » Be clear about the classification of these methodologies according to the type of terrain, excavation diameters and end use of tunnels and galleries
- » Apply the very different soil and rock behaviors defined in other modules of this Postgraduate Certificate to the excavation of tunnels and galleries
- » Recognize the design constraints of the supports and revetments, and understand more deeply their relationship with rock mechanical classifications and soil typologies
- » Adapt all these conditions to other types of deep excavation such as shafts, subway connections, interactions with other structures, etc
- » Analyze the mining excavation , with the particularities it has due to the depth of its actions
- » Detailed knowledge of the interaction of deep excavations on the surface  
Performing an approach to seat calculation in different phases
- » Establish a concrete relationship between seismic disturbances and the stress-strain behavior of tunnels and galleries, as well as to identify how this type of disturbance modifies the supports and linings



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 Geotechnics Applied to Tunnel Excavations and Mining 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 professionals are at the best university. Don't let this great opportunity pass you by"*

## 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 Technical Department
- » 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.





“A comprehensive syllabus focused on acquiring knowledge and converting it into real skills, created to propel you to excellence”



## Module 1. Tunnel and Mining Engineering

- 1.1. Excavation Methods
  - 1.1.1. Application of Methodologies According to geology
  - 1.1.2. Excavation Methodologies According to Length
  - 1.1.3. Construction Risks of Tunnel Excavation Methodologies
- 1.2. Tunnels in Rock– Tunnels in Soil
  - 1.2.1. Basic Differences in Tunnel Excavation According to Grounds
  - 1.2.2. Problems in the Excavation of Tunnels in Soil
  - 1.2.3. Problems Encountered in the Excavation of Rock Tunnels
- 1.3. Tunnels With Conventional Methods
  - 1.3.1. Conventional Excavation Methodologies
  - 1.3.2. Excavation Ability in Grounds
  - 1.3.3. Yields According to Methodology and Geotechnical Characteristics
- 1.4. Tunnels With Mechanical Methods (TBM)
  - 1.4.1. Types of TBM
  - 1.4.2. Tunnel Supports in Tunnels Excavated With TBM
  - 1.4.3. Yields According to Methodology and Geomechanical Characteristics
- 1.5. Microtunnels
  - 1.5.1. Range of Use of Microtunnels
  - 1.5.2. Methodologies According to the Objectives and Geology
  - 1.5.3. Coatings and Limitations of Microtunnels
- 1.6. Support and Coatings
  - 1.6.1. General Support Calculation Methodology
  - 1.6.2. Sizing of Final Coatings
  - 1.6.3. Long Term Behaviour of Coatings







1.7. Wells, Galleries and Connections

1.7.1. Well and Gallery Sizing

1.7.2. Connections and Provisional Breakages of Tunnels

1.7.3. Auxiliary Elements in the Excavation of Shafts, Galleries and Connections

1.8. Mining Engineering

1.8.1. Particular Characteristics of Mining Engineering

1.8.2. Particular Types of Excavation

1.8.3. Particular Planning for Mining Excavations

1.9. Ground Movements Seating

1.9.1. Movement Stages in Tunnel Excavations

1.9.2. Semiempirical Methods for the Determination of Tunnel Seating

1.9.3. Finite Element Calculation Methodologies

1.10. Seismic and Hydrostatic Loads in Tunnels

1.10.1. Influence of Hydraulic Loads in Support Coatings

1.10.2. Long-Term Hydrostatic Loads in Tunnels

1.10.3. Seismic Modeling and its Impact on Tunnel Design

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*A unique learning opportunity  
that will catapult your career  
to the next level Don't let it slip  
away”*

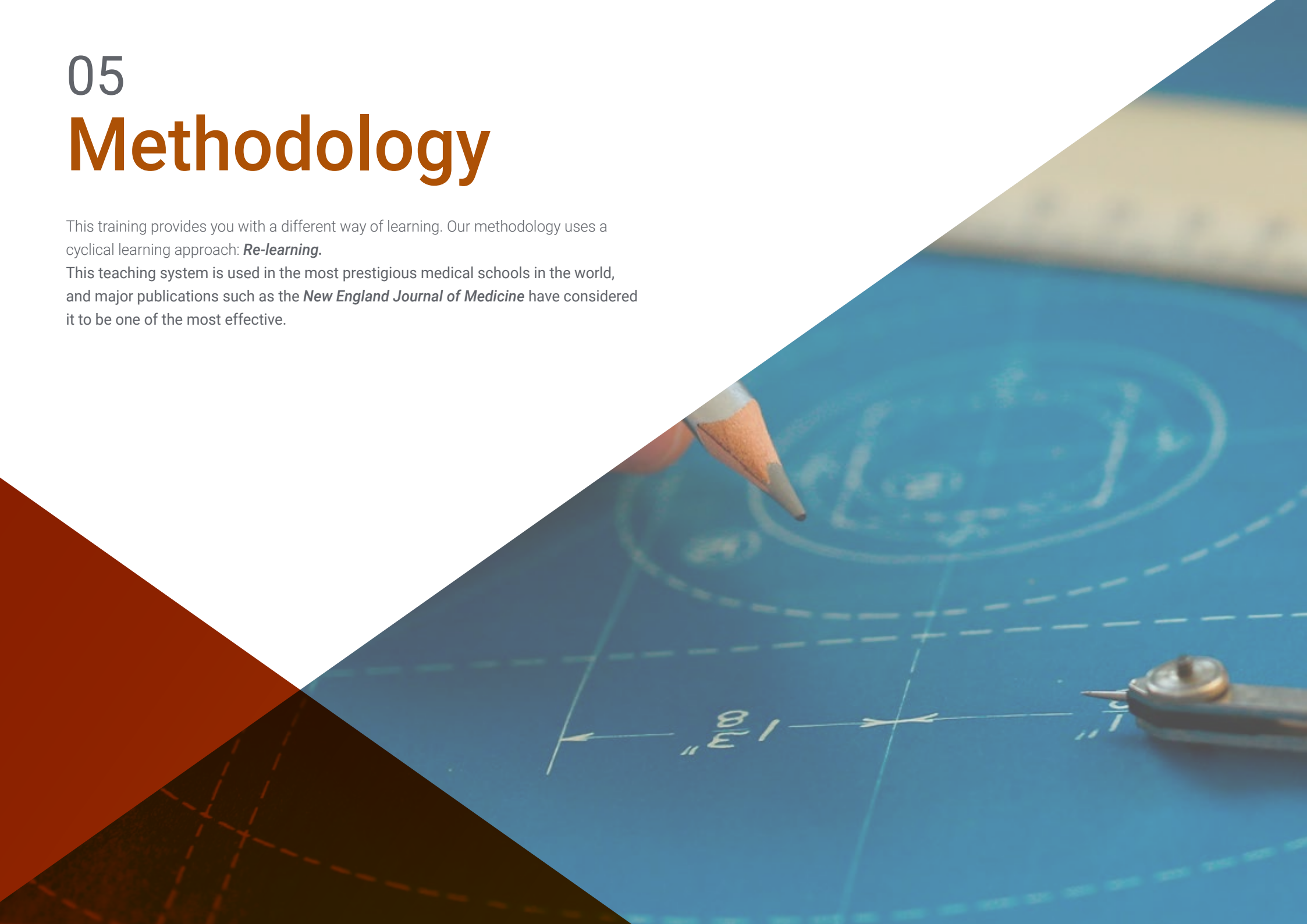


05

# 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.

“

*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 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. 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 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 program, 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 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, program 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 program, 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.



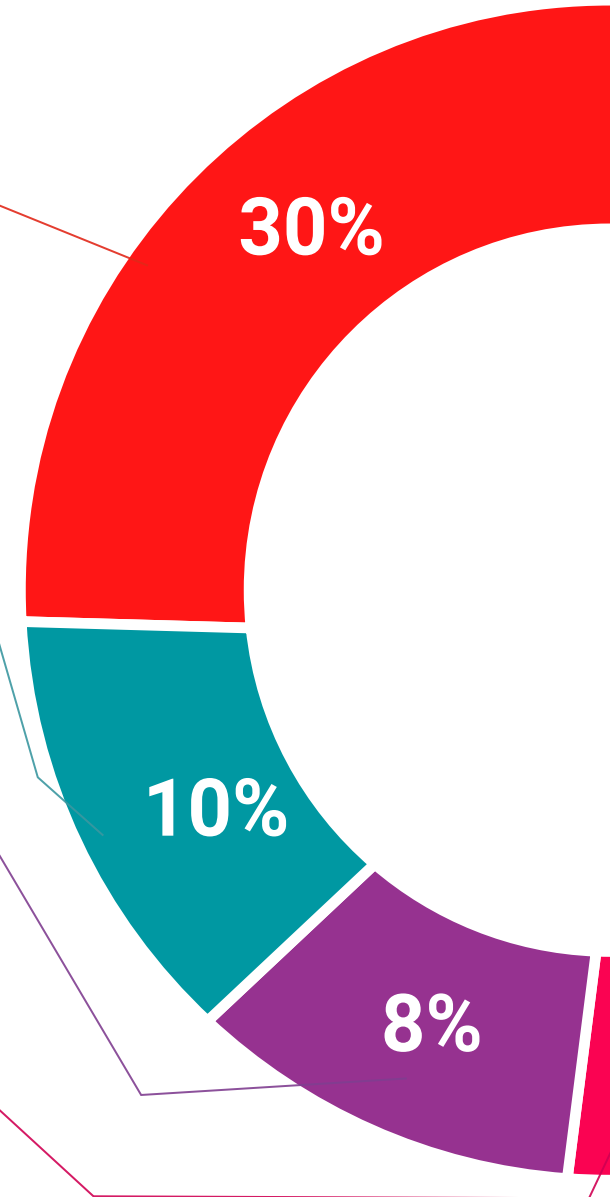
### Practising Skills and Abilities

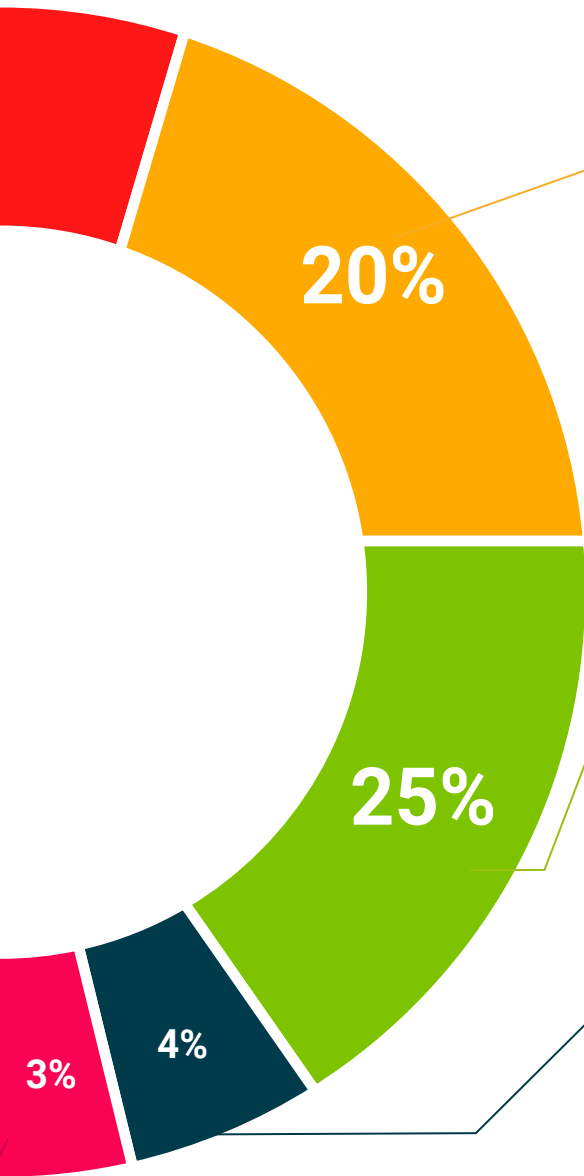
You will carry out activities to develop specific skills and abilities in each subject area. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop in the context of the globalization we live in.



### Additional Reading

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

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

The **Postgraduate Certificate in Geotechnics Applied to Tunneling and Mining Excavations** guarantees in addition to the most rigorous training, access to a Postgraduate Certificate issued by **TECH - Technological University**.



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*Successfully complete this Postgraduate Certificate and receive your certificate without having to travel or conduct laborious paperwork”*



The **Postgraduate Certificate in Geotechnics Applied to Tunneling and Mining Excavations** contains the scientific most complete and up-to-date educational 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 required by labor exchanges, competitive examinations career evaluation committees.

Title: **Postgraduate Certificate in Geotechnics Applied to Tunneling and Mining Excavations**

ECTS: **6**

Official Number of Hours: **150**



\*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.

future

health confidence people

education information tutors

guarantee accreditation teaching

institutions technology learning

community commitment

innovation

personalized service

knowledge present

online training

development

language

classroom

**tech** technological  
university

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