

# Postgraduate Diploma Water Collection and Storage Infrastructures





## Postgraduate Diploma Water Collection and Storage Infrastructures

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

Website: [www.techtute.com/pk/engineering/postgraduate-diploma/postgraduate-diploma-water-collection-storage-infrastructures](http://www.techtute.com/pk/engineering/postgraduate-diploma/postgraduate-diploma-water-collection-storage-infrastructures)

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# 01

# Introduction

In the world, access to water, a totally necessary liquid in life, is scarce for some. That is why engineering experts have been working on different methods that can provide society with ways in which water can be collected and stored. Currently, this is a field that is very active and that is why the professionals in Civil Engineering must be at the forefront of all innovative techniques and water harvesting systems, in addition to being aware of new knowledge about the particular elements that are part of the hydraulic infrastructure. All this with a pedagogical format 100% online and with a team of experienced teachers with decades of experience in the sector.





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*Thanks to this Postgraduate Diploma you will be at the forefront of the most recent innovations in Hydraulic Infrastructure”*

The problem of water scarcity tends to worsen in regions where there is already a deficit, for example, in areas where rainfall is infrequent. Being a dry environment, the ways or methods of water harvesting may be different from a humid space. Therefore, professionals in this area have been implementing the most recent water harvesting techniques to avoid the lack of an indispensable resource in the life of human beings. All this through a due hydrological process, which will also help to preserve the environment.

The graduates will not only deepen their knowledge of catchment and its methods in general, but will also strengthen their competences in the development of specialized skills to carry out flood studies in fluvial areas. In this sense, this Postgraduate Diploma will provide the professionals with updates on the Hydraulic Infrastructures of Catchment and Storage and the analysis of sub-disciplines such as Hydrology and Hydraulics.

In this way, students will be able to broaden their skills in specific areas of the field of study such as Typical, Unitary, dimensionless and triangular hydrographs, being these the hydrological parameters of watersheds. A program that integrates a specialized teaching team and at the same time, supported with a multimedia content of the highest quality offering convenience and time flexibility.

That is why TECH has in mind the excellence and comfort where it provides the most updated, innovative and exclusive material, being a program in which you will only need an electronic device with Internet access. This way you will be able to access the virtual platform from the comfort of the place where you are, and thus open your lessons without any schedule problem.

This **Postgraduate Diploma in Water Collection and Storage Infrastructures** contains the most complete and up-to-date program on the market. The most important features include:

- ◆ The development of case studies presented by experts in Civil Engineering focused in Water Collection and Storage Infrastructures
- ◆ Graphic, schematic, and 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 expert, debate forums on controversial topics, and individual reflection assignments
- ◆ Content that is accessible from any fixed or portable device with an Internet connection



*Civil engineers have started to implement the most innovative water harvesting techniques and you will only find those tools at TECH”*

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*The development of case studies presented by experts in Civil Engineering focused on Water Collection and Storage Infrastructures”*

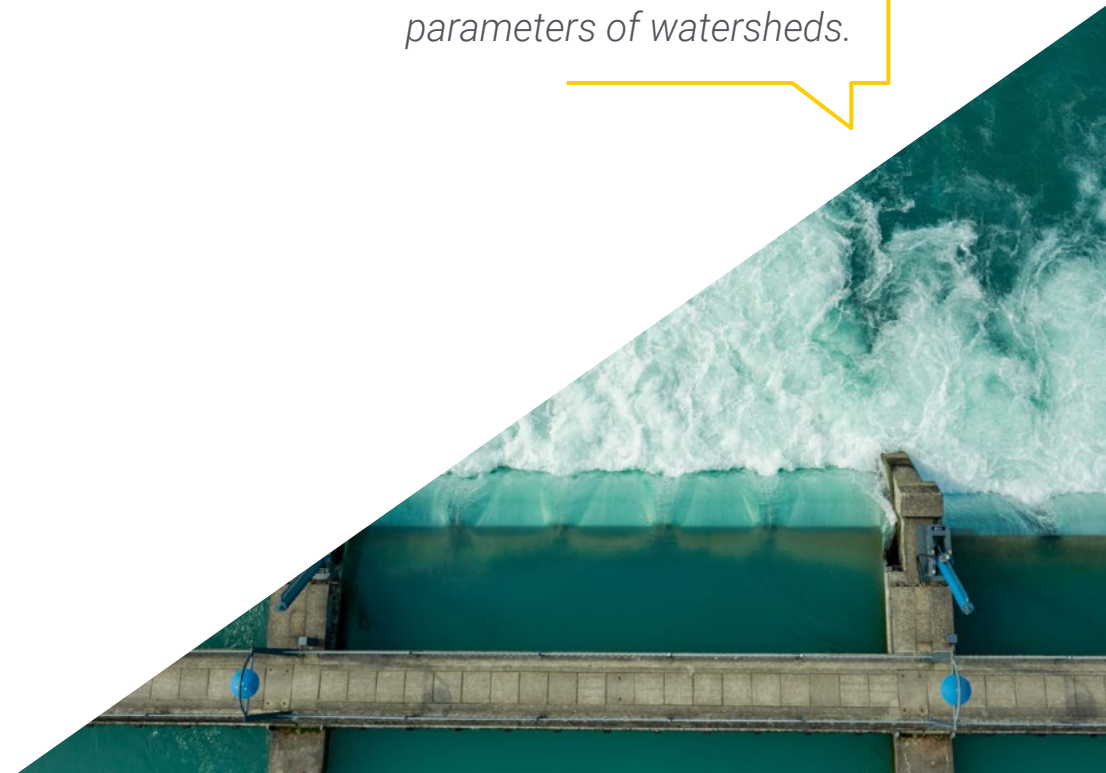
The program's teaching staff includes professionals from sector who contribute their work experience to this educational program, as well as renowned specialists from leading societies and prestigious universities.

Its multimedia content, developed with the latest educational technology, will provide the professionals with situated and contextual learning, i.e., a simulated environment that will provide an immersive education programmed to learn in real situations.

The design of this program focuses on Problem-Based Learning, by means of which the professionals must try to solve the different professional practice situations that are presented throughout the academic course. For this purpose, the students will be assisted by an innovative interactive video system created by renowned experts.

*Graduates will strengthen their competencies in the development of specialized skills to carry out flood studies of fluvial areas.*

*In this field of study you will broaden your skills in specific areas such as typical, unit, dimensionless and triangular hydrographs; these being the hydrological parameters of watersheds.*



# 02

# Objectives

This Postgraduate Diploma in Water Collection and Storage Infrastructures has been designed with the aim of providing the professional with the best innovations in the field of Hydraulic Infrastructures. For this reason, TECH offers different ways of learning with didactic tools that will serve as support in the development of the program. At the end, the students will have nurtured their knowledge in areas such as Stochastic Processes and Time Series Models and, in addition, in Hydrological Modeling, each of its methods will be analyzed.





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*This Postgraduate Diploma has been designed with the aim of providing the professional with the best innovations in the field of Hydraulic Infrastructures”*



## General Objectives

- ◆ Specify the most relevant concepts of hydrology and hydraulics for their application in civil engineering
- ◆ Analyze the key elements that apply, in particular, to hydraulic infrastructures of the water cycle
- ◆ Develop specialized knowledge on the application of these concepts to the design of such infrastructures
- ◆ Present practical cases to apply the knowledge acquired
- ◆ Identify the main elements of a water collection, storage and purification system
- ◆ Evaluate different alternatives for the selection of collection and/or purification systems
- ◆ Develop the main criteria for the design of the elements that are part of the system
- ◆ Base the practical cases on the theoretical knowledge acquired
- ◆ Develop new knowledge on BIM methodology, the concept of information model, collaborative workflows and modeling tools
- ◆ Generate skills in dam modeling using advanced softwares
- ◆ Extrapolate theoretical concepts to the design and modeling of these types of structures
- ◆ Analyze the use and application of BIM methodology in the project, construction and dam operation





## Specific Objectives

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### Module 1. Hydrology and Hydraulics for Civil Engineering

- ◆ Apply the concepts of surface hydrology to natural environments in order to carry out watershed hydrological models and urban hydrological models
- ◆ Compile the different methods applied in surface hydrology to assess their potentialities
- ◆ Develop specialized skills to carry out flood studies of fluvial areas
- ◆ Analyze the elements of general hydraulics in the design of hydraulic infrastructures
- ◆ Generate new knowledge on the particular elements that are part of a hydraulic infrastructure
- ◆ Define the hydraulic variables that must intervene in our design of channels and pipelines, identifying the hydrodynamics of the infrastructure

### Module 2. Dams, catchments and water treatment. Elements and design

- ◆ Develop key knowledge of dam typology and its application
- ◆ Determine the fundamentals of dam design, according to their typology
- ◆ Analyze water catchment systems
- ◆ Establish the elements of a catchment
- ◆ Examine the main processes for water purification
- ◆ Identify the main parameters for the selection of treatment systems
- ◆ Apply theoretical knowledge for the presentation of solutions to practical cases

### Module 3. Modeling of dams

- ◆ Examine the fundamentals of BIM methodology applied to Civil Engineering
- ◆ Determine the workflows in the development of a BIM model of dams
- ◆ Develop skills in modeling vertical and horizontal structures
- ◆ Analyze design solutions and alternatives in dam modeling
- ◆ Establish the main BIM objects that make up a dam model
- ◆ Propose solutions to real civil engineering problems using advanced software
- ◆ Apply the BIM methodology assuming the role of modeler and enriching models with the necessary information for their construction and exploitation



*Upon completion of the program, the students will have nurtured their knowledge in areas such as Hydrological Modeling and each of its methods”*

# 03

# Course Management

With TECH, you will be able to obtain a qualification of excellence, counting on first class tools that will help the students throughout the program. That is why the graduates will have access to a syllabus created exclusively by a teaching team specialized in Urban Planning, Layout, Lands and Roads and Road, Canals and Ports Engineering. The experience of these specialists will allow the graduates to solve doubts that may arise in the process of this Postgraduate Diploma.



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*With TECH you will have access to a syllabus created exclusively by a teaching team specialized in Urban Planning and Civil Engineering”*

## Management



### D. González González, Blas

- ♦ Managing Director at Tolvas Verdes Malacitanas S.A
- ♦ CEO in Andaluza de Traviesas
- ♦ Director of Engineering and Development at GEA 21, S.A. Head of the Technical Services of the UTE Metro of Seville and co-director of the Construction Projects for Line 1 of the Metro of Seville
- ♦ CEO in Bética de Ingeniería S.A.L
- ♦ Teacher of several university master's degrees related to Civil Engineering, as well as subjects of the Degree in Architecture at the University of Seville
- ♦ Degree in Civil Engineering from the Polytechnic University of Madrid
- ♦ Master's Degree in New Materials Science and Nanotechnology from the University of Seville
- ♦ Master's Degree in BIM Management in Infrastructure and Civil Engineering by EADIC - Rey Juan Carlos University

## Professors

### D. Pedraza Martínez, Horacio

- ◆ Layout, earth and pavement specialist for the construction project of the San Martín de Valdeiglesias Bypass, for the Ministry of Public Works
- ◆ Author and project manager of several road maintenance projects in the provinces of Granada and Jaén
- ◆ Specialist in earthworks, pavements and drainage for the bidding project: New Road M-410
- ◆ Co-author of the construction project for the extension of Line 2 of the Malaga Subway
- ◆ Author of the layout project for the A-318 Olivar Highway
- ◆ Graduate in Civil Engineering from the University of Granada
- ◆ Master's Degree BIM in Civil Engineering from the University of Seville

### Ms. Pérez Vallecillos, Natalia

- ◆ Hydraulics specialist for the construction engineering project with OPWP (Oman Power and Water Procurement Company)
- ◆ Hydraulic specialist in the bidding phase of the potable water network of the urban development complex with ACWA Power
- ◆ Project manager for the preliminary design of the intake, pumping, pipelines and water treatment plant in Dhaka
- ◆ Collaborator in the elaboration of hydraulic works projects with URCI CONSULTORES, S.L
- ◆ Project coordinator for the production, transport and distribution of drinking water in La Concordia, Argentina
- ◆ Graduated in Civil Engineering at E.T.S.I.C.C.P. of Granada

### Mr. García Romero, Francisco

- ◆ Interim Civil Servant of the Senior Faculty of Civil Engineers A2003
- ◆ Interim Substitute Professor in the Projects Area, associated to the Department of
- ◆ Engineering Construction and Engineering Projects of the ETSI of Seville
- ◆ Graduate in Civil Engineering from the University of Seville, specializing in Civil Construction
- ◆ Graduate in Civil Engineering from the University of Seville, specializing in Civil Construction
- ◆ MSc in Civil Engineering from the University of Seville
- ◆ Specialist in BIM Modeling by the CA1 Department of the University of Seville



*Take the opportunity to learn about the latest advances in this field in order to apply it to your daily practice”*

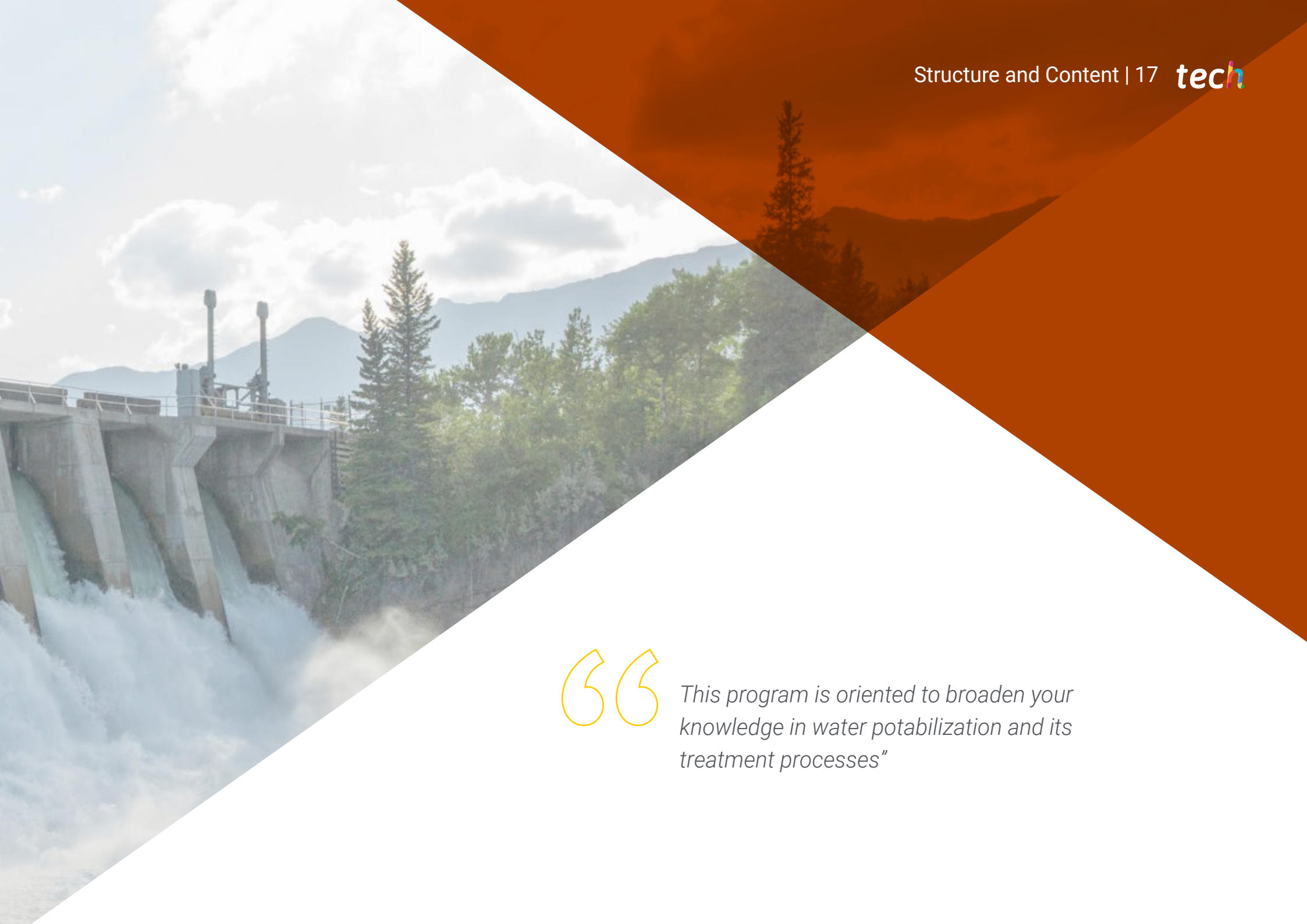
# 04

# Structure and Content

This program has been designed with respect to the most recent updates in Hydraulic Works, where a curriculum that provides the best content in terms of Water Collection and Storage Infrastructures has been developed. This Postgraduate Diploma is oriented to broaden your knowledge in water purification and treatment processes. This will be achieved with the support of multimedia materials which offers dynamism, ensuring the success in the development of this qualification.







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*This program is oriented to broaden your knowledge in water potabilization and its treatment processes”*

## Module 1. Hydrology and Hydraulics for Civil Engineering

- 1.1. Surface and urban hydrology
  - 1.1.1. Precipitation
  - 1.1.2. Infiltration
  - 1.1.3. Groundwater
  - 1.1.4. Flow rate. Duration and mass curves
  - 1.1.5. Probability distribution functions used in hydrology
  - 1.1.6. Analysis of drought frequencies
  - 1.1.7. Stochastic Processes Time series models
- 1.2. Rainfall. Precipitation - Runoff Ratio
  - 1.2.1. The design storm
  - 1.2.2. Historical analysis of maximum rainfall intensities
  - 1.2.3. Flood hydrographs
- 1.3. Hydrological parameters of catchment areas
  - 1.3.1. Typical hydrograph
  - 1.3.2. Unit Hydrograph
  - 1.3.3. Dimensionless Hydrographs
  - 1.3.4. Triangular Hydrographs
- 1.4. Determination of discharge flow rates
  - 1.4.1. Flood flow
  - 1.4.2. Transit of reservoirs
  - 1.4.3. Transit in natural watercourses
- 1.5. Hydrological Modeling
  - 1.5.1. Témez method
  - 1.5.2. Rational Method
  - 1.5.3. SCS Method
  - 1.5.4. Hydraulic Modeling
- 1.6. Applications in Thermal Imaging Engineering
  - 1.6.1. In Construction and Industry
  - 1.6.2. In Agriculture and Livestock Farming
  - 1.6.3. In Emergencies

- 1.7. Free sheet pipelines. Hydraulic fundamentals
  - 1.7.1. Water flow in pipelines
  - 1.7.2. Classification of flows in channels
  - 1.7.3. Flow states
- 1.8. Properties of flow in open channels
  - 1.8.1. Types of open channels
  - 1.8.2. Geometry of an artificial channel
  - 1.8.3. Elements of a channel section
  - 1.8.4. Velocity and pressure distribution in channels
  - 1.8.5. Flow energy in open channels
  - 1.8.6. Critical flow status
  - 1.8.7. Local phenomena. Hydraulic Highlighting
- 1.9. Uniform motion in channels
  - 1.9.1. Uniform flow characteristics
  - 1.9.2. Uniform flow equations
  - 1.9.3. Common formulas for uniform motion in channels
- 1.10. Varied motions
  - 1.10.1. Gradually varied motion in rivers and streams
  - 1.10.2. Wave propagation
  - 1.10.3. Pressures and dynamic forces
  - 1.10.4. Waves and Water hammer
  - 1.10.5. Valve closure. Gradual, rapid and instantaneous

## Module 2. Dams, catchments and water treatment. Elements and design

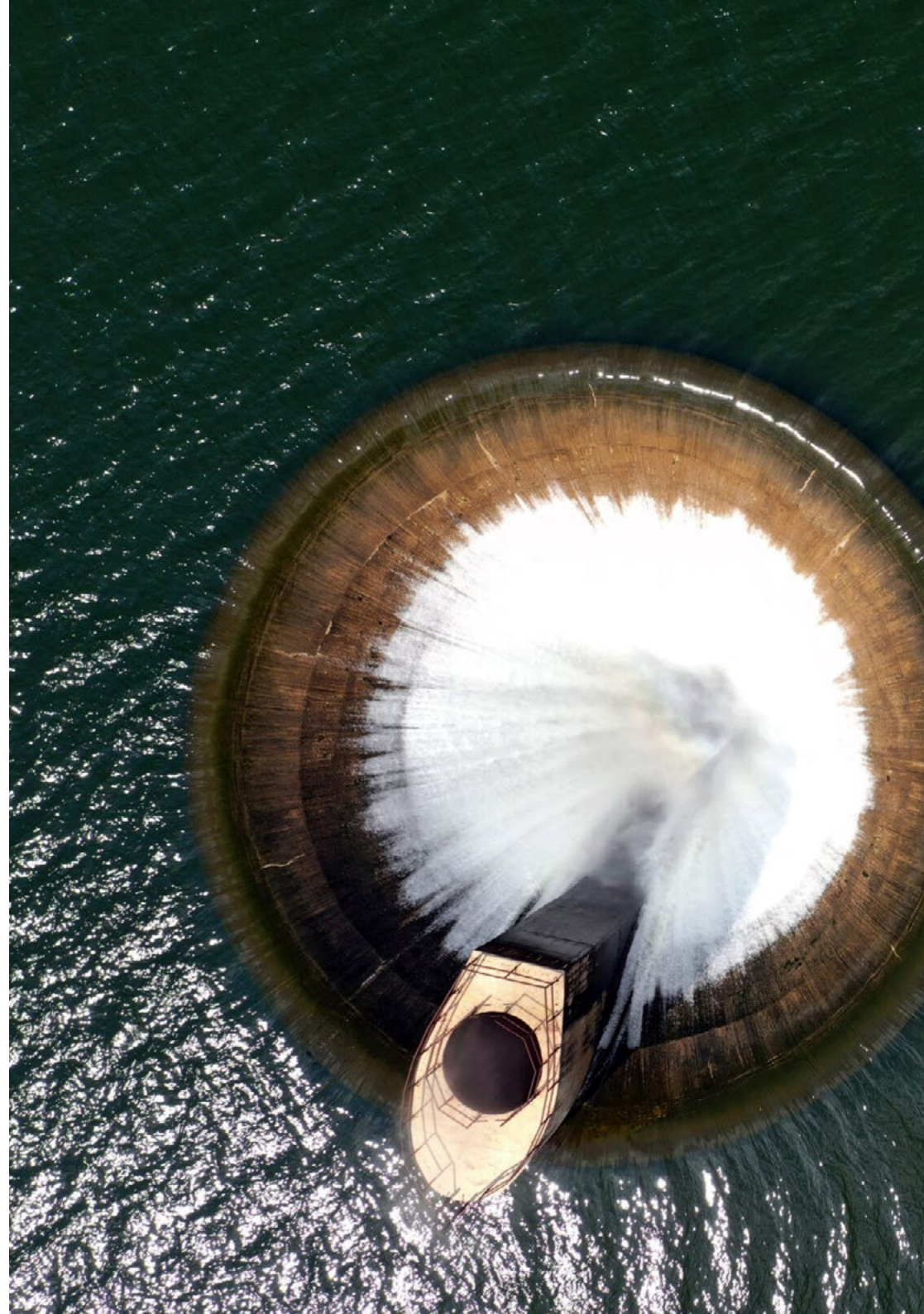
- 2.1. Water Storage System
  - 2.1.1. Water Storage Systems
  - 2.1.2. Surface and subway storage
  - 2.1.3. Water Pollution Problems
- 2.2. Surface water catchment
  - 2.2.1. Rainwater catchment
  - 2.2.2. Catchments in river courses
  - 2.2.3. Catchments in lakes and reservoirs



- 2.3. Groundwater abstraction
  - 2.3.1. Groundwater
  - 2.3.2. Protection of aquifers
  - 2.3.3. Calculation of wells
- 2.4. Dams
  - 2.4.1. Types of dams
  - 2.4.2. Main elements of dams
  - 2.4.3. Previous studies
- 2.5. Spillways and drains
  - 2.5.1. Typology
  - 2.5.2. Avenues study
  - 2.5.3. Main Components
- 2.6. Construction of dams
  - 2.6.1. River diversion
  - 2.6.2. Construction of cofferdams and closure of the river bed
  - 2.6.3. Constructive considerations on dams of different typology
- 2.7. Water purification
  - 2.7.1. Water Treatment
  - 2.7.2. Treatment Processes
  - 2.7.3. Treatment equipment
- 2.8. Drinking water treatment processes
  - 2.8.1. Treatment of Other Pollutants
  - 2.8.2. Additives in drinking water treatment
  - 2.8.3. Disinfection
- 2.9. By-products of water treatment
  - 2.9.1. Nature of Sludge
  - 2.9.2. Treatment Processes
  - 2.9.3. Final destination of sludge
- 2.10. Report to be Submitted
  - 2.10.1. Renewable energy generation
  - 2.10.2. Reservoirs and pumping stations as a source of clean energy generation
  - 2.10.3. International energy regulation

### Module 3. Modeling of dams

- 3.1. Digital construction
  - 3.1.1. Digital construction
  - 3.1.2. Building Information Models
  - 3.1.3. BIM Technology
- 3.2. Dam modeler. Civil 3D
  - 3.2.1. Civil 3D interface
  - 3.2.2. Workspaces
  - 3.2.3. Template configuration
- 3.3. Site survey
  - 3.3.1. Preliminary site analysis
  - 3.3.2. Civil 3D model preparation
  - 3.3.3. Study of Alternatives
- 3.4. Civil 3D modeling strategy
  - 3.4.1. Workflow
  - 3.4.2. Model of linear works in Civil 3D
  - 3.4.3. Modeling strategy for loose material dams
  - 3.4.4. Modeling strategy for gravity dams
- 3.5. Creation of assemblies for weir bodies
  - 3.5.1. Methods for the creation of subassemblies
  - 3.5.2. Choice of the type profile
  - 3.5.3. Creation of subassemblies from the profile type
- 3.6. Generation of the gravity dam linear structure
  - 3.6.1. Design slope
  - 3.6.2. Creation of the Linear Work
  - 3.6.3. Parameters and surface of the linear work
  - 3.6.4. Checking the proper functioning of the assemblies
- 3.7. Complementary works
  - 3.7.1. Dam spillway
  - 3.7.2. Dam crest roads
  - 3.7.3. Inner galleries



- 3.8. Parameterization in Civil 3D
  - 3.8.1. Types of properties according to their origin
  - 3.8.2. Property types by data format
  - 3.8.3. Creation of user-defined parameters
- 3.9. Generation of the dam body model in Revit
  - 3.9.1. Model preparation in Revit
  - 3.9.2. Dynamo routine for the creation of solids from Civil 3D to Revit
  - 3.9.3. Execution of the Dynamo routine
- 3.10. Model of a gravity dam in Revit
  - 3.10.1. Dam body
  - 3.10.2. Constructive divisions
  - 3.10.3. Control and maneuvering installations



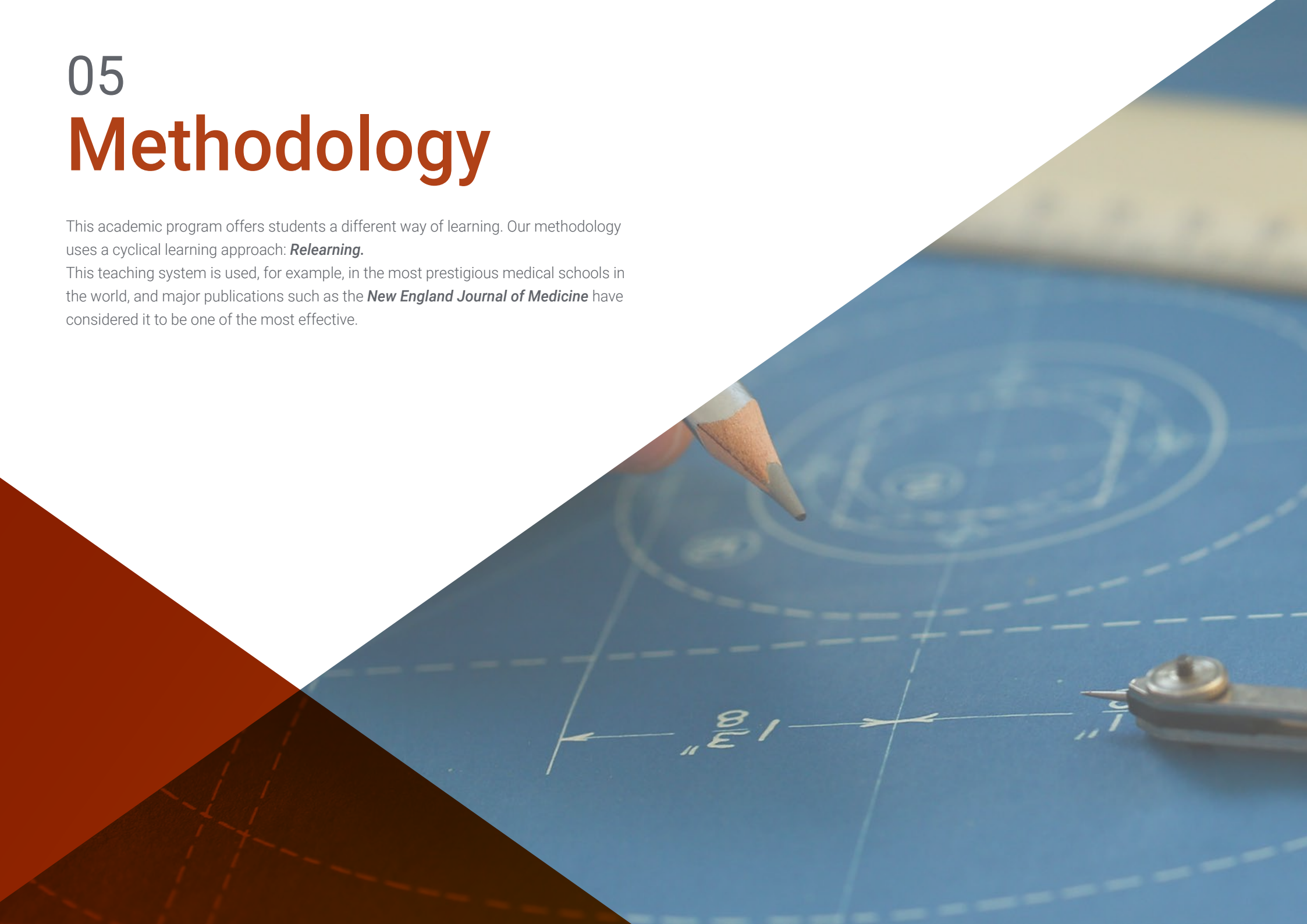
*TECH offers exclusive multimedia material that gives you great dynamism, ensuring success in the development of this qualification"*

05

# Methodology

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

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





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*Discover Relearning, a system that abandons conventional linear learning, to take you through cyclical teaching systems: a way of learning that has proven to be extremely effective, especially in subjects that require memorization"*

## Case Study to contextualize all content

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

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



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





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

### A learning method that is different and innovative

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

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

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

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

## Relearning Methodology

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

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

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

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

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



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

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

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

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

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



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



### Study Material

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

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



### Classes

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

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



### Practising Skills and Abilities

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



### Additional Reading

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





#### Case Studies

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



#### Interactive Summaries

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

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



#### Testing & Retesting

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



06

# Certificate

The Postgraduate Diploma in Water Collection and Storage Infrastructures guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Diploma issued by TECH Technological University.





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*Successfully complete this program  
and receive your university qualification  
without having to travel or fill out  
laborious paperwork”*

This **Postgraduate Diploma in Water Collection and Storage Infrastructures** contains the most complete and up-to-date program on the market.

After the student has passed the assessments, they will receive their corresponding **Postgraduate Diploma** issued by **TECH Technological University** via tracked delivery\*.

The certificate issued by **TECH Technological University** will reflect the qualification obtained in the Postgraduate Diploma, and meets the requirements commonly demanded by labor exchanges, competitive examinations, and professional career evaluation committees.

Title: **Postgraduate Diploma in Water Collection and Storage Infrastructures**

Official N° of hours: **450 h.**



\*Apostille Convention. In the event that the student wishes to have their paper certificate issued with an apostille, TECH EDUCATION will make the necessary arrangements to obtain it, at an additional cost.



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



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