

# Postgraduate Certificate Concrete and Structural Steel





## Postgraduate Certificate Concrete and Structural Steel

- » Modality: online
- » Duration: 12 weeks
- » Certificate: TECH Technological University
- » Schedule: at your own pace
- » Exams: online

Website: [www.techtitute.com/us/engineering/postgraduate-certificate/concrete-structural-steel](http://www.techtitute.com/us/engineering/postgraduate-certificate/concrete-structural-steel)

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# 01

# Introduction

Concrete and steel are materials widely used in the construction of structures that offer great advantages such as high strength, durability, and versatility. For this reason, TECH has created this program that offers a comprehensive and updated training in this field, responding to the current needs of the engineer. In this way, the graduate will learn about the advantages and disadvantages of these materials, structural analysis models, ultimate and serviceability limit states, and the execution and maintenance of reinforced concrete and steel structures. In addition, the program is developed in a 100% online format and uses the Relearning methodology, which allows students to learn autonomously and flexibly, adapting the pace of study to their needs and without geographical limits.





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*In this 12-week Postgraduate Certificate, you will learn in depth the practical skills necessary for the maintenance of Concrete structures"*

The construction sector is a key sector in the world economy, accounting for approximately 13% of global GDP and employing around 7% of the world's workforce. The importance of this sector lies in the need for resistant and durable structures that guarantee the safety of people and the stability of infrastructures.

That is why TECH has created a program that allows students to acquire skills and knowledge in the execution and maintenance of reinforced concrete and steel structures. Throughout the syllabus, students will learn about ultimate and serviceability limit states and structural analysis models, which are fundamental elements to guarantee the quality and safety of built structures.

Knowledge of the design and construction of strong and durable structures is essential for the construction industry. In this sense, the program offered by TECH provides students with the opportunity to acquire technical and theoretical skills in the execution and maintenance of reinforced concrete and steel structures. Students will also become familiar with the ultimate and serviceability limit states and structural analysis models to ensure the safety and durability of structures.

A unique academic opportunity offered in a 100% online format, allowing students to learn in a flexible way and adapt the pace of study to their needs. In addition, uses the most effective methodology, TECH Relearning.

This **Postgraduate Certificate in Concrete and Structural Steel** 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
- ◆ The graphic, schematic, and practical contents with which they are created, provide practical information on the disciplines that are essential for professional practice
- ◆ Practical exercises where self-assessment can be used 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



*You will be able to execute concreting following general criteria and pre and post-concreting processes"*

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*Delve into the limit state of transverse deformations in thin panels in this 300-hour program"*

The program's teaching staff includes professionals from the 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 professional 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 professional must try to solve the different professional practice situations that are presented throughout the academic course. For this purpose, the student will be assisted by an innovative interactive video system created by renowned experts.

*Access a syllabus rich in content, where you will find a large number of real-life examples and practical analysis that contextualizes the topics covered.*

*Get up to date on the identification of the factors of aggressiveness on concrete.*



# 02

# Objectives

The program in Concrete and Structural Steel has been designed with the objective of providing graduates with a first-level learning experience. In this way, they will acquire skills and tools to design and build safe and resistant structures, which will allow them to access a labor market in constant growth and with great demand for qualified professionals. Therefore, you will not only broaden your knowledge but also improve and update it to enhance your performance and compete effectively in an increasingly demanding and dynamic environment.







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*Upon completion of the program, you will be able to become an elite engineer capable of designing strong, durable, and safe steel and concrete structures”*



## General Objectives

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- ◆ Autonomous learning of new knowledge and techniques suitable for Civil Engineering
- ◆ To know in detail the nature, characteristics, and performance of the new construction materials that have been investigated in recent years
- ◆ Understand and use the language of engineering and the terminology of Civil Engineering
- ◆ Delve in a scientific and technical way in the activity of the profession of Public Works Technical Engineer with knowledge of the functions of consultancy, analysis, design, calculation, project, construction, maintenance, conservation, and operation





## Specific Objectives

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- ◆ Design, plan, build and maintain reinforced concrete and steel structures based on knowledge of the fundamentals of the behavior of these structures
- ◆ Analyze and understand how the characteristics of structures influence their behavior
- ◆ Apply knowledge of the resistant performance of structures in order to evaluate them according to existing standards and using analytical and numerical calculation methods

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*Achieve your most ambitious professional goals thanks to a university program that will take you to the forefront of the uses of Concrete and Structural Steel”*

# 03

## Structure and Content

This syllabus not only presents a wealth of detailed videos and interactive summaries but also includes a wide variety of additional texts for each topic covered. In this way, the engineer will have the possibility to delve into those aspects that most interest them and accumulate a wide and detailed bibliography on the most recent advances in the field of Concrete and Structural Steel. All this can be accessed 24 hours a day from any device with an Internet connection, which provides great convenience in the process of learning and professional updating.





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*You will be able to download all the content and access a reference guide in your field, with a special emphasis on the most advanced analytical methodology”*

## Module 1. Structural Steel

- 1.1. Introduction to Structural Steel Design
  - 1.1.1. Advantages of Steel as a Structural Material
  - 1.1.2. Disadvantages of Steel as a Structural Material
  - 1.1.3. First Uses of Iron and Steel
  - 1.1.4. Steel Profiles
  - 1.1.5. Stress-Strain Relationship of Structural Steel
  - 1.1.6. Modern Structural Steels
  - 1.1.7. Use of High-Strength Steels
- 1.2. General Principles for the Project and Construction of Steel Structures
  - 1.2.1. General Principles for the Project and Construction of Steel Structures
  - 1.2.2. Structural Design Work
  - 1.2.3. Responsibilities
  - 1.2.4. Specifications and Building Codes
  - 1.2.5. Economical Design
- 1.3. Calculation Basis and Structural Analysis Models
  - 1.3.1. Calculation Basis
  - 1.3.2. Structural Analysis Models
  - 1.3.3. Determination of Areas
  - 1.3.4. Sections
- 1.4. Ultimate Limit States I
  - 1.4.1. General Aspects. Strength Limit State of the Sections
  - 1.4.2. Equilibrium Limit State
  - 1.4.3. Strength Limit State of the Sections
  - 1.4.4. Axial Force
  - 1.4.5. Bending Moment
  - 1.4.6. Shear Stress
  - 1.4.7. Torsion
- 1.5. Ultimate Limit States II
  - 1.5.1. Instability Limit State
  - 1.5.2. Elements Subjected to Compression
  - 1.5.3. Elements Subjected to Bending
  - 1.5.4. Elements Subjected to Compression and Bending

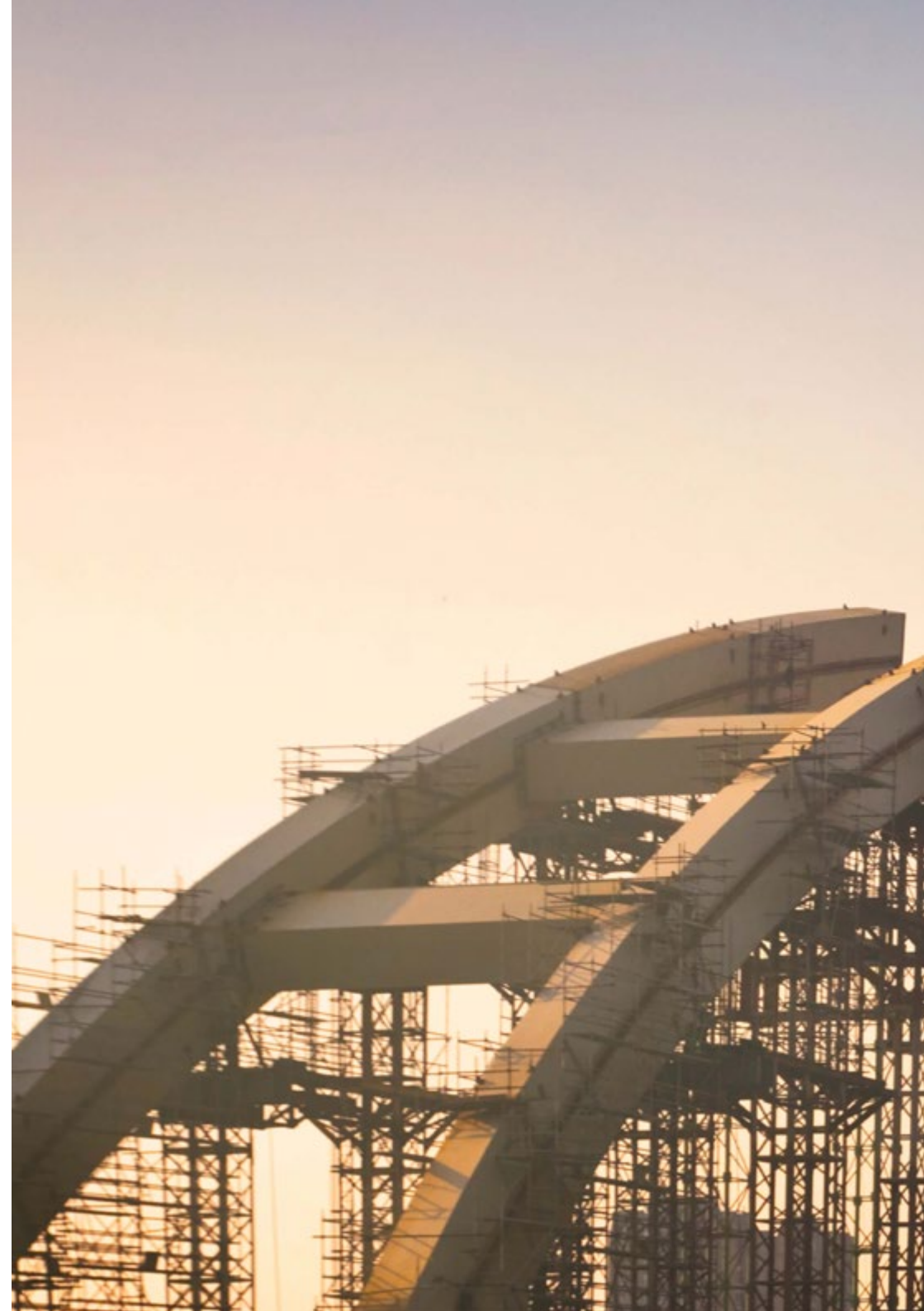




- 1.6. Ultimate Limit States III
  - 1.6.1. Ultimate Limit States of Stiffness
  - 1.6.2. Longitudinally Stiffened Elements
  - 1.6.3. Shear Web Buckling
  - 1.6.4. Web Resistance to Transverse Loads
  - 1.6.5. Web Buckling Induced by the Compressed Flange
  - 1.6.6. Stiffeners
- 1.7. Serviceability Limit States
  - 1.7.1. General Aspects
  - 1.7.2. Deformation Limit States
  - 1.7.3. Vibrations Limit States
  - 1.7.4. Limit State of Transverse Deformations in Thin Panels
  - 1.7.5. Local Plasticization Limit State
- 1.8. Joining Methods: Screws
  - 1.8.1. Joining Methods: General Aspects and Classifications
  - 1.8.2. Bolted Joints - Part 1: General Aspects. Types of Screws and Constructive Arrangements
  - 1.8.3. Bolted Joints - Part 2: Calculation
- 1.9. Joining Methods: Welds
  - 1.9.1. Welded Joints - Part 1: General Aspects. Classifications and Defects
  - 1.9.2. Welded Joints - Part 2: Constructive Arrangements and Residual Stresses
  - 1.9.3. Welded Joints - Part 3: Calculation
  - 1.9.4. Design of Beam and Pillar Joints
  - 1.9.5. Bearing Apparatus and Pillar Bases
- 1.10. Steel Structures Facing Fire
  - 1.10.1. General Considerations
  - 1.10.2. Mechanical and Indirect Actions
  - 1.10.3. Properties of Materials Under Fire
  - 1.10.4. Strength Testing of Prismatic Elements under Fire
  - 1.10.5. Joint Strength Testing
  - 1.10.6. Calculation of Temperatures in Steel

## Module 2. Structural Concrete

- 2.1. Introduction
  - 2.1.1. Subject Introduction
  - 2.1.2. Historical Notes about Concrete
  - 2.1.3. Mechanical Behavior of Concrete
  - 2.1.4. Combined behavior of steel and concrete that has led to its success as a composite material
- 2.2. Project Basis
  - 2.2.1. Actions
  - 2.2.2. Concrete and Steel Characteristics
  - 2.2.3. Durability-Oriented Calculation Basis
- 2.3. Structural Analysis
  - 2.3.1. Structural Analysis Models
  - 2.3.2. Data Required for Linear, Plastic, or Nonlinear Modeling
  - 2.3.3. Materials and Geometry
  - 2.3.4. Pre-stressing Effects
  - 2.3.5. Calculation of In-Service Sections
  - 2.3.6. Shrinkage and Creep
- 2.4. Service Life And Maintenance Of Reinforced Concrete
  - 2.4.1. Concrete Durability
  - 2.4.2. Concrete Mass Deterioration
  - 2.4.3. Steel Corrosion
  - 2.4.4. Identification of Factors of Aggressiveness on Concrete
  - 2.4.5. Protective Measures
  - 2.4.6. Concrete Structures Maintenance
- 2.5. Serviceability Limit State Calculations
  - 2.5.1. The Limit States
  - 2.5.2. Concept and Method
  - 2.5.3. Verification of Cracking Requirements
  - 2.5.4. Verification of Deformation Requirements







- 2.6. Relative Calculations to the Ultimate Limit States
  - 2.6.1. Resistance Behavior of Linear Concrete Elements
  - 2.6.2. Bending and Axial
  - 2.6.3. Calculation of Second-Order Effects with Axial Loading
  - 2.6.4. Shear
  - 2.6.5. Flush
  - 2.6.6. Torsion
  - 2.6.7. Regions D
- 2.7. Sizing Criteria
  - 2.7.1. Common Application Cases
  - 2.7.2. The knot
  - 2.7.3. The Cantilever
  - 2.7.4. The Large-Edge Beam
  - 2.7.5. Concentrated Load
  - 2.7.6. Dimension changes in Beams and Columns
- 2.8. Common Structural Elements
  - 2.8.1. The Beam
  - 2.8.2. The Pillar
  - 2.8.3. The Slab
  - 2.8.4. Foundation Elements
  - 2.8.5. Introduction to Pre-stressed Concrete
- 2.9. Constructive Arrangements
  - 2.9.1. General Aspects and Terminology
  - 2.9.2. Coatings
  - 2.9.3. Hooks
  - 2.9.4. Minimum Diameters
- 2.10. The Execution of Concreting
  - 2.10.1. General Criteria
  - 2.10.2. Previous Processes to the Concreting
  - 2.10.3. Elaboration, Assembly and Erection of Reinforcements
  - 2.10.4. Preparation and Placement of Concrete
  - 2.10.5. Post-Concreting Processes
  - 2.10.6. Premade Elements
  - 2.10.7. Environmental Aspects

04

# 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.





*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.



05

# Certificate

The Postgraduate Certificate in Concrete and Structural Steel guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate 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 Certificate in Concrete and Structural Steel** 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 Certificate** issued by **TECH Technological University** via tracked delivery\*.

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

Title: **Postgraduate Certificate in Concrete and Structural Steel**

Official N° of Hours: **300 h.**



\*Apostille Convention. In the event that the student wishes to have their paper diploma 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 languages  
virtual classroom



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