

# Postgraduate Certificate

## Mechanics of Deformable Solids



## Postgraduate Certificate Mechanics of Deformable Solids

- » 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/mechanics-deformable-solids](http://www.techtute.com/in/engineering/postgraduate-certificate/mechanics-deformable-solids)

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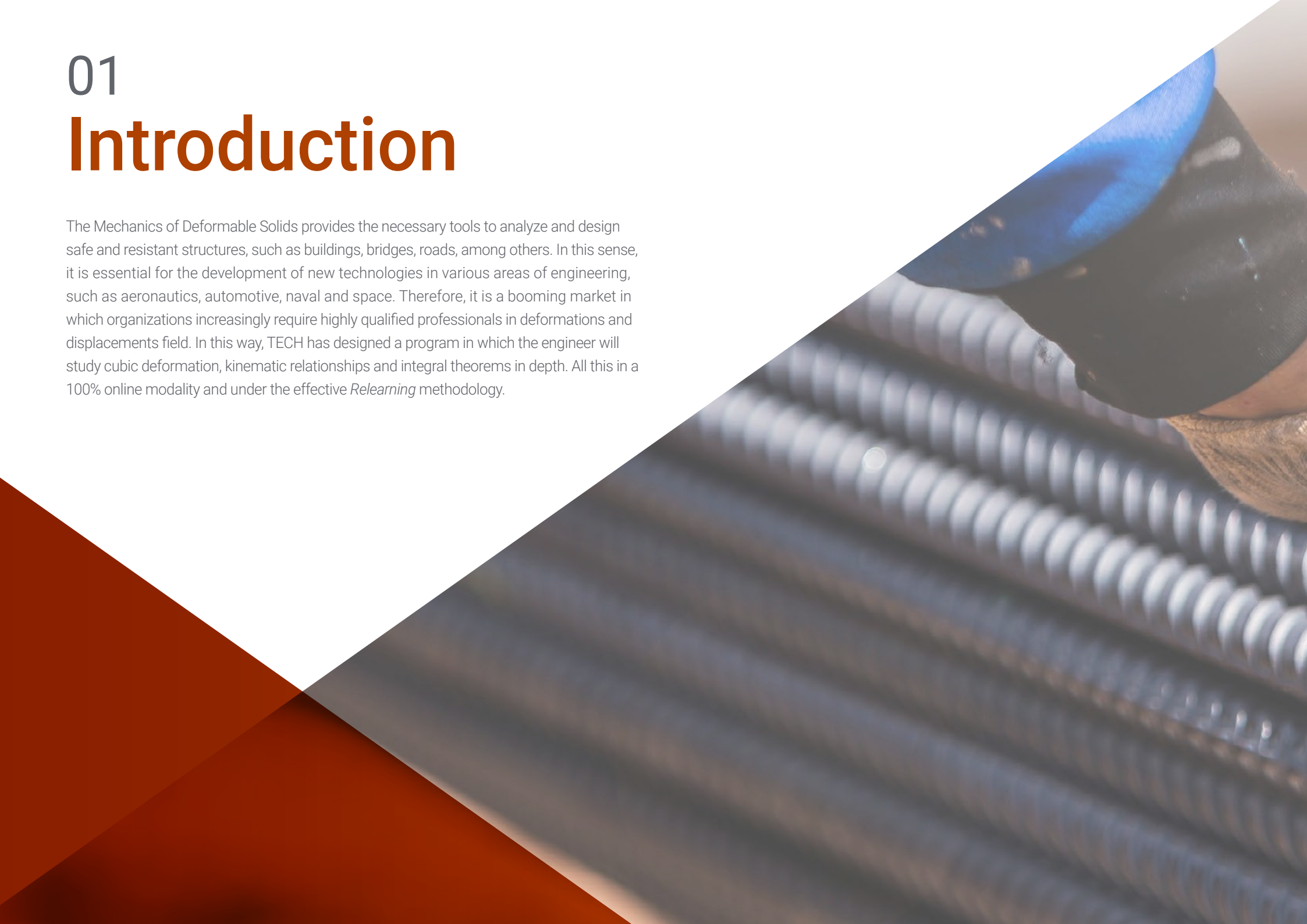
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# 01

# Introduction

The Mechanics of Deformable Solids provides the necessary tools to analyze and design safe and resistant structures, such as buildings, bridges, roads, among others. In this sense, it is essential for the development of new technologies in various areas of engineering, such as aeronautics, automotive, naval and space. Therefore, it is a booming market in which organizations increasingly require highly qualified professionals in deformations and displacements field. In this way, TECH has designed a program in which the engineer will study cubic deformation, kinematic relationships and integral theorems in depth. All this in a 100% online modality and under the effective *Relearning* methodology.







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*Do you want to specialize in areas such as aeronautics, automotive, marine and space? This Postgraduate Certificate is the first step”*

CFD Techniques for Pre-Design and Analysis in Computational Fluid Mechanics are fundamental tools in modern engineering, and their use has become increasingly common in solving complex fluid problems in various industries. Computational Fluid Mechanics (CFD) is a constantly evolving field that seeks to improve accuracy and efficiency in the analysis and design of systems involving fluids. Currently, CFD is essential in areas such as aeronautics, automotive, energy and environment.

In order to respond to the current needs of the engineer, this program of CFD Techniques for Pre-design and Analysis in Computational Fluid Mechanics is presented. In this way, this program aims to provide engineers with the necessary fluid simulation tools to solve problems in the design of products and systems, allowing them to reduce costs and development times.

In addition, the program is developed in a 100% online format, which allows the student to access the content from anywhere and at any time, and has the *Relearning* methodology, focused on active learning and practical application of the knowledge acquired. In this way, the engineer will obtain cutting-edge and solid education in highly relevant topics such as CFD theory, simulation of incompressible and compressible flows, simulation of heat transfer and simulation of fluid-structure interaction.

This **Postgraduate Certificate in Mechanics of Deformable Solids** contains the most complete and up-to-date program on the market. The most important features include:

- ◆ The development of practical cases presented by experts in Civil Engineering
- ◆ The 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 self-assessment can be used 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



*Become a leader in the engineering industry with the skills acquired in this program!"*

“

*Are you looking for a comprehensive program in deformable solid mechanics? With TECH it is possible”*

*You will develop specialized skills in beam theory and stress and deformation analysis.*

*Become a highly skilled engineer with this online course.*

The program's teaching staff includes professionals from the field who contribute their work experience to this educational 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 education programmed to learn 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 students will be assisted by an innovative interactive video system created by renowned and experienced experts.



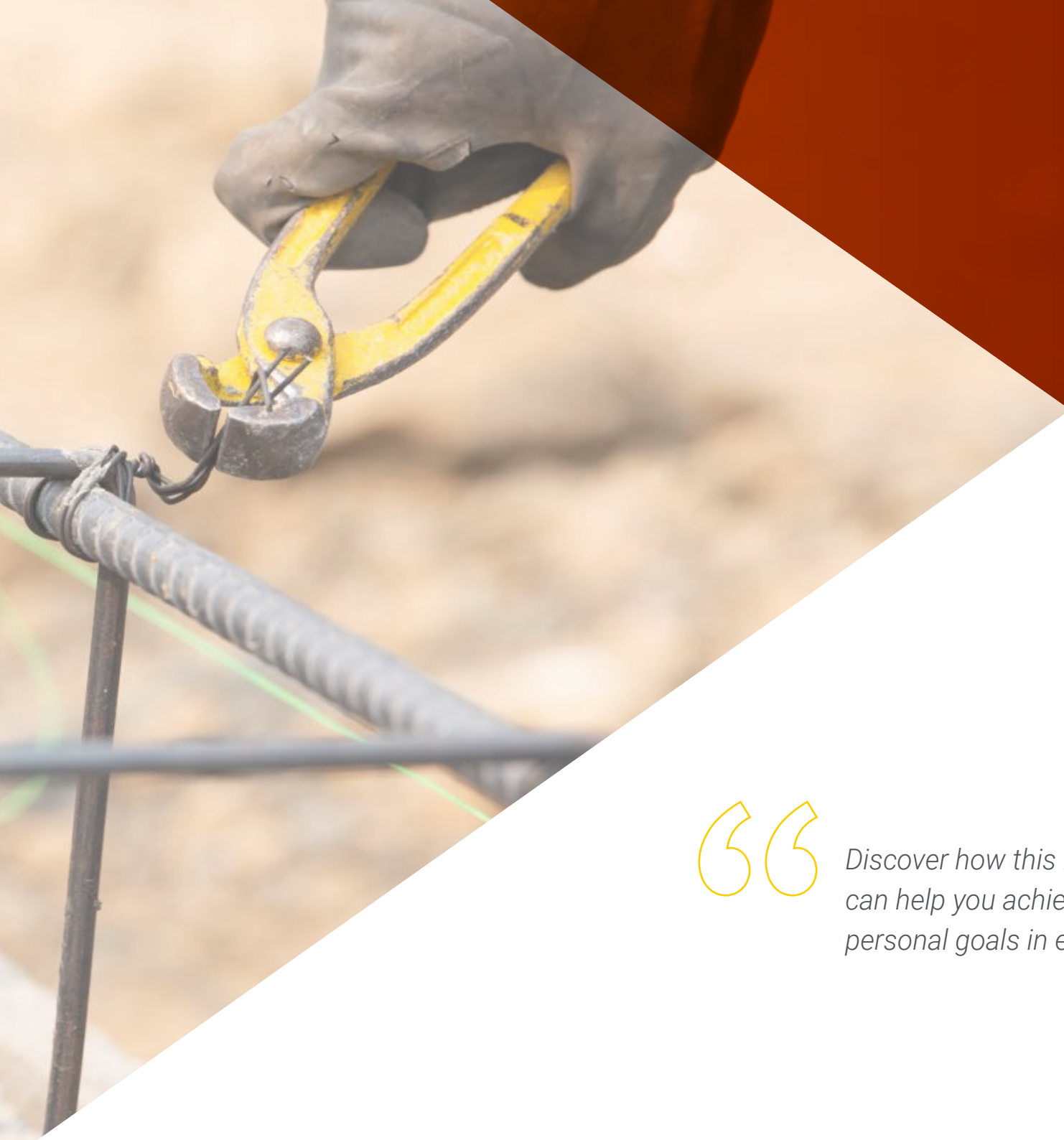
# 02

# Objectives

The Postgraduate Certificate in Mechanics of Deformable Solid is an online program that provides engineers with specialized skills in the design and analysis of structures and solid systems. As such, this program provides fundamental knowledge of deformation, stresses, kinematic and constitutive relationships, and beam theory. Thanks to the comprehensive knowledge you will gain, you will be able to ensure safety and avoid accidents in various structures and systems, and it is important for the development of new technologies in areas such as aeronautics, automotive, naval and space.







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*Discover how this Postgraduate Certificate can help you achieve your professional and personal goals in engineering”*



## General Objectives

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







## Specific Objectives

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- ◆ Analyze and understand how the characteristics of structures influence their behavior
- ◆ Apply knowledge of the resistant performance of structures in order to dimension them according to existing standards and using analytical and numerical calculation methods

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*Are you looking for a quality program for your professional development? This program is your best option”*



# 03

## Structure and Content

TECH has designed an educational program that offers a wide range of topics including beam theory, deformation, stresses, kinematic relationships and constitutive relationships. In addition, students will also learn more about local and global stress analysis, as well as the behavior of materials under various loads and conditions. In addition, thanks to the *Relearning* methodology in which it is taught, it allows graduates to adapt their schedules and balance them with other responsibilities.





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*You will acquire essential knowledge to ensure safety and prevent accidents in various structures and systems”*



## Module 1. Mechanics of Deformable Solids

- 1.1. Basic Concepts
  - 1.1.1. Structural Engineering
  - 1.1.2. Concept of Continuous Medium
  - 1.1.3. Surface and Volume Forces
  - 1.1.4. Lagrangian and Eulerian Formulations
  - 1.1.5. Euler's Laws of Motion
  - 1.1.6. Integral Theorems
- 1.2. Deformations
  - 1.2.1. Deformation: Concept and Elementary Measurements
  - 1.2.2. Displacement Field
  - 1.2.3. The Hypothesis of Small Displacements
  - 1.2.4. Kinematic Equations. Deformation Tensor
- 1.3. Kinematic Relationships
  - 1.3.1. Deformational State in the Environment of a Point
  - 1.3.2. Physical Interpretation of the Components of the Deformation Tensor
  - 1.3.3. Principal Deformations and Principal Deformation Directions
  - 1.3.4. Cubic Deformation
  - 1.3.5. Elongation of a Curve and Change of Volume of the Body
  - 1.3.6. Compatibility Equations
- 1.4. Stresses and Static Relationships
  - 1.4.1. Concept of Stress
  - 1.4.2. Relationships between Stresses and External Forces
  - 1.4.3. Local Stress Analysis
  - 1.4.4. Mohr's Circle
- 1.5. Constitutive Relationships
  - 1.5.1. Concept of Ideal Behavioral Model
  - 1.5.2. Uniaxial Responses and One-Dimensional Ideal Models
  - 1.5.3. Classification of Behavioral Models
  - 1.5.4. Generalized Hooke's Law
  - 1.5.5. Elastic Constants
  - 1.5.6. Deformation Energy and Complementary Energy
  - 1.5.7. Limits of the Elastic Model







- 1.6. The Elastic Problem
  - 1.6.1. Linear Elasticity and the Elastic Problem
  - 1.6.2. Local Formulation of the Elastic Problem
  - 1.6.3. Global Formulation of the Elastic Problem
  - 1.6.4. General Results
- 1.7. Theory of Beams: Fundamental Assumptions and Results I
  - 1.7.1. Derived Theories
  - 1.7.2. The Beam: Definitions and Classifications
  - 1.7.3. Additional Hypotheses
  - 1.7.4. Kinematic Analysis
- 1.8. Theory of Beams: Fundamental Assumptions and Results II
  - 1.8.1. Static Analysis
  - 1.8.2. Constitutive Equations
  - 1.8.3. Deformation Energy
  - 1.8.4. Formulation of the Stiffness Problem
- 1.9. Bending and Elongation
  - 1.9.1. Interpretation of the Results
  - 1.9.2. Estimation of out of Directrix Displacements
  - 1.9.3. Estimation of Normal Stresses
  - 1.9.4. Estimation of Shear Stresses due to Bending
- 1.10. Theory of Beams: Torsion
  - 1.10.1. Introduction
  - 1.10.2. Coulomb's Torsion Balance
  - 1.10.3. Saint-Venant Torsion Theory
  - 1.10.4. Introduction to Non-Uniform Torsion



*You will have 24-hour access to the extensive library of teaching resources provided by TECH"*

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 Mechanics of Deformable Solid 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 Mechanics of Deformable Solids** 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 certificate 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 Mechanics of Deformable Solids**

Official N° of hours: **150 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 reality  
development languages  
virtual classroom

**tech** technological  
university

## Postgraduate Certificate

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- » Dedication: 16h/week
- » Schedule: at your own pace
- » Exams: online



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