

# Postgraduate Certificate Materials Physics



## Postgraduate Certificate Materials Physics

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

Website: [www.techtitute.com/us/engineering/postgraduate-certificate/materials-physics](http://www.techtitute.com/us/engineering/postgraduate-certificate/materials-physics)

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# 01

# Introduction

The discovery of new natural resources and especially the latest advances in the development of new supermaterials has made Materials Science particularly well known, thanks to its social and economic impact. Graphene, coltan and bismuth sulfides are currently highly valued for their properties and applications in the field of technology. In this scenario of progress, the engineering professional has ample opportunities to thrive in the creation and design of innovative projects. However, it is necessary for this profile to have a solid knowledge, which can be easily achieved through this 100% online program. An education that will lead you to learn about the different properties of materials, crystalline structures or the use of phase diagrams through a theoretical and practical approach. Also, with an multimedia content that can be accessed 24 hours a day from a computer with Internet connection.



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*With this 100% online course you will master the main properties of materials and extrapolate this knowledge to engineering projects”*

Although it is true that materials have been used by man since prehistoric times, the desire to discover new resources that improve the quality and efficiency of products has made the physics of materials particularly important. Its relevance is even greater today, given the latest discoveries of energy superconducting materials such as graphene or materials whose properties are essential for the operation of technological devices such as cell phones.

Materials are present in everyday life and are key to the development of humanity itself as well as to the growth of certain productive sectors. In this scenario, the Engineering specialist who masters the different properties of materials will have ample opportunities to thrive in this field of Materials Physics. For this reason, TECH Global University has designed this program taught exclusively online, which seeks to provide the graduate with the most relevant information in this field.

For this purpose, the professional has at his disposal innovative pedagogical tools that can be accessed at any time of the day, from an electronic device with an Internet connection. Thus, through this convenient format, the graduate will be able to learn about crystalline structures, phase diagrams, as well as the different properties of materials: mechanical, electrical, magnetic or thermal.

Likewise, the Relearning system, based on the repetition of content, will allow you to advance through the program's syllabus in a much more natural and agile way, reducing even the long hours of study that are so frequent in other teaching methods.

The specialist is thus faced with an excellent option for a flexible university education, which is at the academic forefront and compatible with professional and/or personal responsibilities.

This **Postgraduate Certificate in Materials Physics** contains the most complete and up-to-date program on the market. The most important features include:

- ◆ Practical case studies are presented by experts in Physics
- ◆ 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 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



*Enroll now in a university education that brings you closer to the Materials Physics in a much more dynamic way thanks to multimedia resources”*

“

*This is a degree that will introduce you to the microscopy of macroscopic systems through attractive and entertaining multimedia content”*

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.

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.

*In 180 teaching hours you will be able to obtain the most advanced and exhaustive knowledge about materials, their structures, properties and processing.*

*Delve comfortably from your computer with internet connection into the crystalline structures and their defects.*



# 02

# Objectives

TECH Global University has created this Diploma with the objective of offering the most relevant and detailed information on the Physics of Materials. Thus, in only 180 teaching hours, students will be able to achieve the knowledge they need to master the main concepts, understand the properties of materials and their different applications. The case studies developed by the specialized teaching team, which is part of this degree, will serve to bring students closer to the different natural resources and their application from the field of physics.





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*A curriculum with a theoretical-practical approach that will help you to integrate all the knowledge about Materials Physics in your daily practice”*



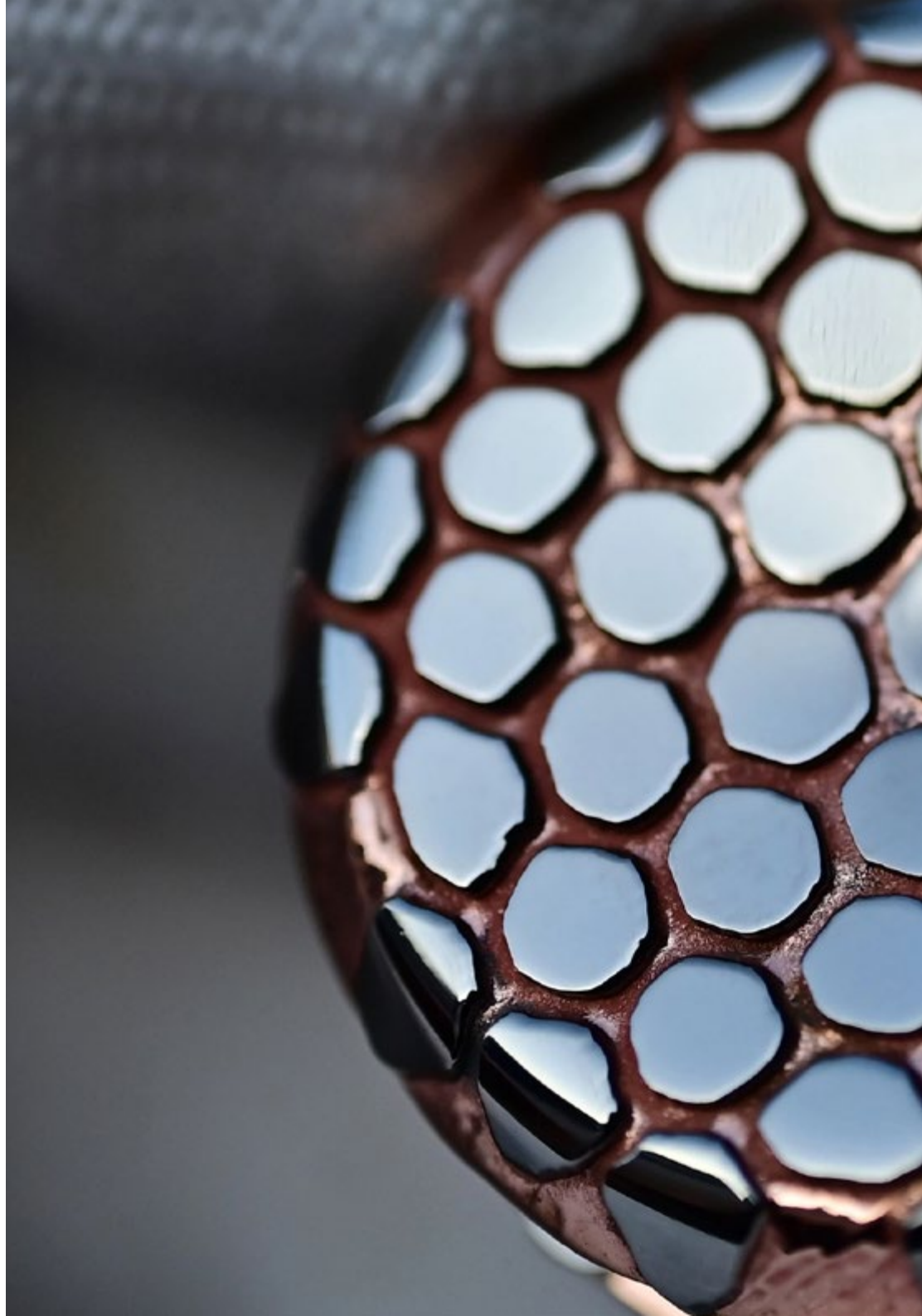
## General Objectives

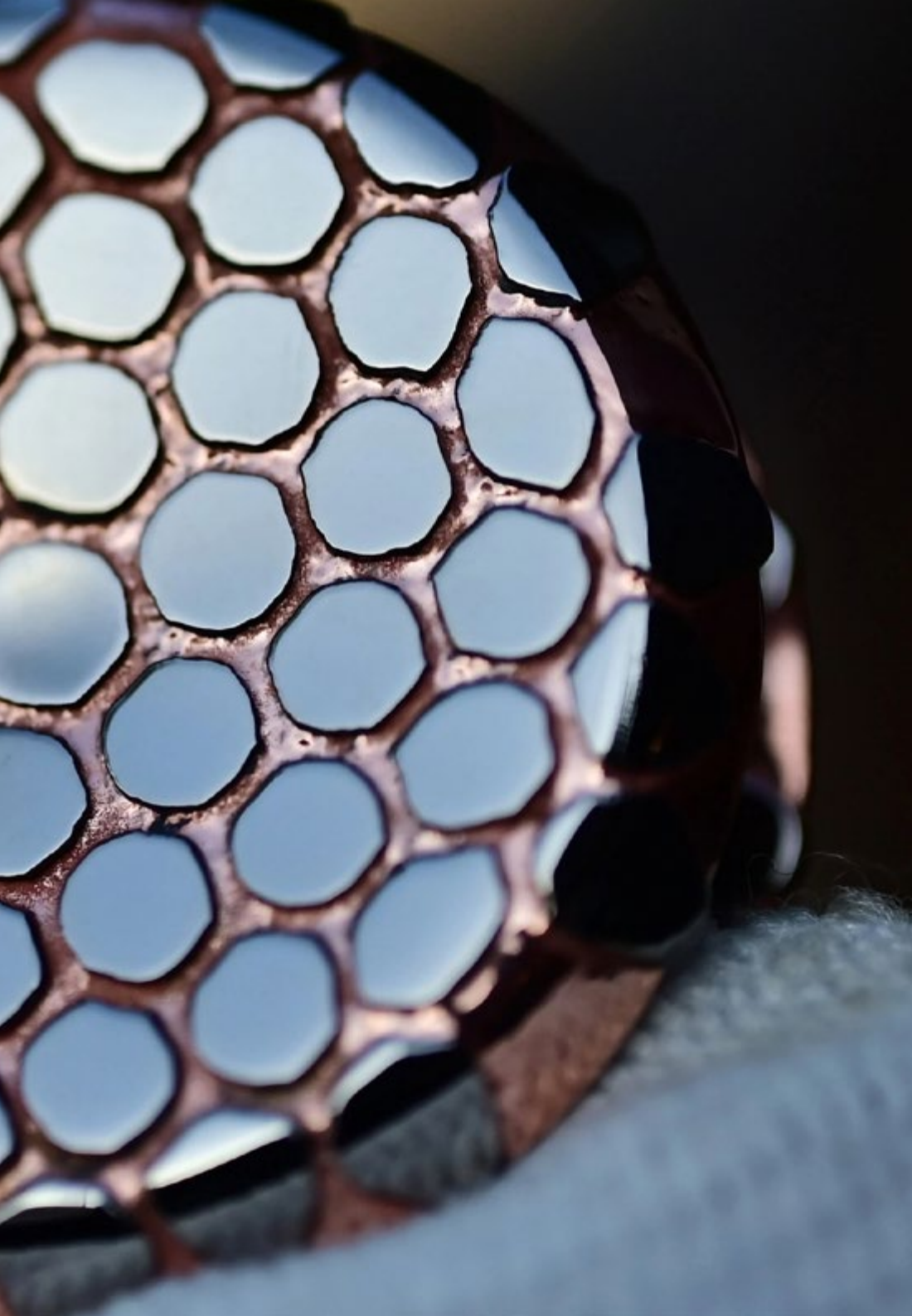
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- ♦ To know the relationship between Materials Science and Physics
- ♦ Understand the Study of Materials Science
- ♦ Apply the Materials Physics in concepts to current technology

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*Enroll now and get the most out of the materials thanks to the intensive learning you will obtain with this university degree”*





## Specific Objectives

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- ◆ Understanding the connection between the microscopic structure (atomic, nanometric or micrometric) and the macroscopic properties of materials, as well as their interpretation in physical terms
- ◆ Master the multiple properties of materials
- ◆ Identify the Structure, Properties and Processing

# 03

# Structure and Content

The syllabus of this Diploma has been designed to provide the engineering professional with the most advanced knowledge on Materials Physics. A resource library of video summaries, in-depth videos, specialized readings and case studies is available to help you learn about the structures and properties of materials in a much more engaging way.



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*The Relearning system used by TECH Global University will allow in all its programs, you to reduce the long hours of study”*

## Module 1. Physics of Materials

- 1.1. Materials Science and Solid State
  - 1.1.1. Field of Study of Materials Science
  - 1.1.2. Classification of Materials According to the Type of Bonding
  - 1.1.3. Classification of Materials According to Their Technological Applications
  - 1.1.4. Relationship between Structure, Properties and Processing
- 1.2. Crystalline Structures
  - 1.2.1. Order and Disorder: Basic Concepts
  - 1.2.2. Crystallography: Fundamental Concepts
  - 1.2.3. Review of Basic Crystal Structures: Simple Metallic and Ionic Structures
  - 1.2.4. More Complex Crystal Structures (Ionic and Covalent)
  - 1.2.5. Structure of Polymers
- 1.3. Defects in Crystalline Structures
  - 1.3.1. Classification of Imperfections
  - 1.3.2. Structural Defects
  - 1.3.3. Punctual Defects
  - 1.3.4. Other Imperfections
  - 1.3.5. Dislocations
  - 1.3.6. Interfacial Defects
  - 1.3.7. Extended Defects
  - 1.3.8. Chemical Imperfections
  - 1.3.9. Substitutional Solid Solutions
  - 1.3.10. Interstitial Solid Solutions
- 1.4. Phase Diagrams
  - 1.4.1. Fundamental Concepts
    - 1.4.1.1. Solubility Limit and Phase Equilibrium
    - 1.4.1.2. Interpretation and Use of Phase Diagrams: Gibbs Phase Rule
  - 1.4.2. 1 Component Phase Diagram
  - 1.4.3. 2 Component Phase Diagram
    - 1.4.3.1. Total Solubility in the Solid State
    - 1.4.3.2. Total Insolubility in the Solid State
    - 1.4.3.3. Partial Solubility in Solid State
  - 1.4.4. 3 Component Phase Diagram
- 1.5. Mechanical Properties
  - 1.5.1. Elastic Deformation
  - 1.5.2. Plastic Deformation
  - 1.5.3. Mechanical Testing
  - 1.5.4. Fracture
  - 1.5.5. Fatigue
  - 1.5.6. Fluence
- 1.6. Electrical Properties
  - 1.6.1. Introduction
  - 1.6.2. Conductivity. Conductors
  - 1.6.3. Semiconductors
  - 1.6.4. Polymers
  - 1.6.5. Electrical Characterization
  - 1.6.6. Insulators
  - 1.6.7. Conductor-Insulator Transition
  - 1.6.8. Dielectrics
  - 1.6.9. Dielectric Phenomena
  - 1.6.10. Dielectric Characterization
  - 1.6.11. Materials of Technological Interest
- 1.7. Magnetic Properties
  - 1.7.1. Origin of Magnetism
  - 1.7.2. Materials with Magnetic Dipole Moment
  - 1.7.3. Types of Magnetism
  - 1.7.4. Local Field
  - 1.7.5. Diamagnetism
  - 1.7.6. Paramagnetism
  - 1.7.7. Ferromagnetism
  - 1.7.8. Antiferromagnetism
  - 1.7.9. Ferrimagnetism
- 1.8. Magnetic Properties II
  - 1.8.1. Domains
  - 1.8.2. Hysteresis
  - 1.8.3. Magnetostriction
  - 1.8.4. Materials of Technological Interest: Magnetically Soft and Hard
  - 1.8.5. Characterization of Magnetic Materials



- 1.9. Thermal Properties
  - 1.9.1. Introduction
  - 1.9.2. Heat Capacity
  - 1.9.3. Thermal Conduction
  - 1.9.4. Expansion and Contraction
  - 1.9.5. Thermoelectric Phenomena
  - 1.9.6. Magnetocaloric Effect
  - 1.9.7. Characterization of Thermal Properties
- 1.10. Macrocanonical Collectivity
  - 1.10.1. Absorption and Re-Emission
  - 1.10.2. Light Sources
  - 1.10.3. Energy Conversion
  - 1.10.4. Optical Characterization
  - 1.10.5. Microscopy Techniques
  - 1.10.6. Nanostructures



*You are just one click away from accessing a Diploma that will open up a whole new field of possibilities in the use of the properties of materials”*

# 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.







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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.



05

# Certificate

The Postgraduate Certificate in Materials Physics guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Global University.





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

This program will allow you to obtain your **Postgraduate Certificate in Materials Physics** endorsed by **TECH Global University**, the world's largest online university.

**TECH Global University** is an official European University publicly recognized by the Government of Andorra ([official bulletin](#)). Andorra is part of the European Higher Education Area (EHEA) since 2003. The EHEA is an initiative promoted by the European Union that aims to organize the international training framework and harmonize the higher education systems of the member countries of this space. The project promotes common values, the implementation of collaborative tools and strengthening its quality assurance mechanisms to enhance collaboration and mobility among students, researchers and academics.

This **TECH Global University** title is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Postgraduate Certificate in Materials Physics**

Modality: **online**

Duration: **6 weeks**

Accreditation: **6 ECTS**



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



## Postgraduate Certificate Materials Physics

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

# Postgraduate Certificate

## Materials Physics

