

Postgraduate Certificate Statistical Physics



Postgraduate Certificate Statistical Physics

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

Website: www.techtitute.com/in/engineering/postgraduate-certificate/statistical-physics

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01

Introduction

Behind many of the experimental studies that attempt to understand matter is the statistics of a system. Modeling its behavior by knowing its macroscopic properties such as temperature or volume can be obtained through Statistical Physics. Without a thorough knowledge in this field, this would not be possible and neither could the study of liquid crystals, phase transitions and critical phenomena be carried out. For this reason, TECH has created this 100% online program, which seeks to offer in only 6 weeks the most advanced and exhaustive knowledge about stochastic processes, statistical mechanics, ideal gases or magnetic systems. To this end, students will have access to innovative teaching resources that can be easily accessed from any electronic device with an Internet connection.



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With this course you will obtain in 6 weeks the most advanced knowledge about Statistical Physics"

Thanks to Statistical Physics we can nowadays understand the behavior of a system formed by a large number of particles whose positions and velocities follow given probability distributions. Thus a neutron star can be studied through this branch of physics, since it is composed of a very large number of particles whose description as a macroscopic system is given by a specific statistic.

Thus, in this fascinating world of numbers and equations, the relationship between the thermodynamic properties and the microscopic properties of physical systems can be studied. An intense and complex field that has led this academic institution to create a Postgraduate Certificate in Statistical Physics of great utility for specialists who wish to deepen their knowledge in this area.

A program, where through video summaries, diagrams, detailed videos, case studies or essential readings, students can easily learn about stochastic processes, statistical mechanics, ideal gases, elementary kinetic theory of gases or magnetic and biological systems. All this through a syllabus with a theoretical-practical approach, through which you can advance in a much more agile way thanks to the *Relearning* system, based on the reiteration of content.

TECH offers professionals the opportunity to study a university program in a convenient and 100% online format. All you need is a computer, tablet or cell phone with an Internet connection to view, at any time, the content available on the Virtual Campus. This makes this program an ideal academic option for those seeking to combine the most demanding responsibilities with a Postgraduate Certificate.

This **Postgraduate Certificate in Statistical 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
- ♦ 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 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 are looking at an academic option that will lead you to master the ideal gases of bosons and fermions"

“*You can dive into quantum paramagnetism, classical paramagnetism and superparamagnetism at any time you wish*”

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 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.

No attendance, no fixed schedules" This academic option is ideal to combine with your professional responsibilities.

Would you like to understand stochastic processes? Thanks to the multimedia pills of this course, it will be much easier for you. Enroll now.



02 Objectives

Thanks to this 100% online program, the graduates will be able to achieve an exhaustive knowledge of Statistical Physics being able to apply the different theories in an efficient way. For this purpose, multimedia resources are available to be accessed 24 hours a day from any device with Internet connection and case studies developed by the teaching team that integrates this program.



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A syllabus with a theoretical-practical approach that will lead you to master the essential concepts of Statistical Physics"

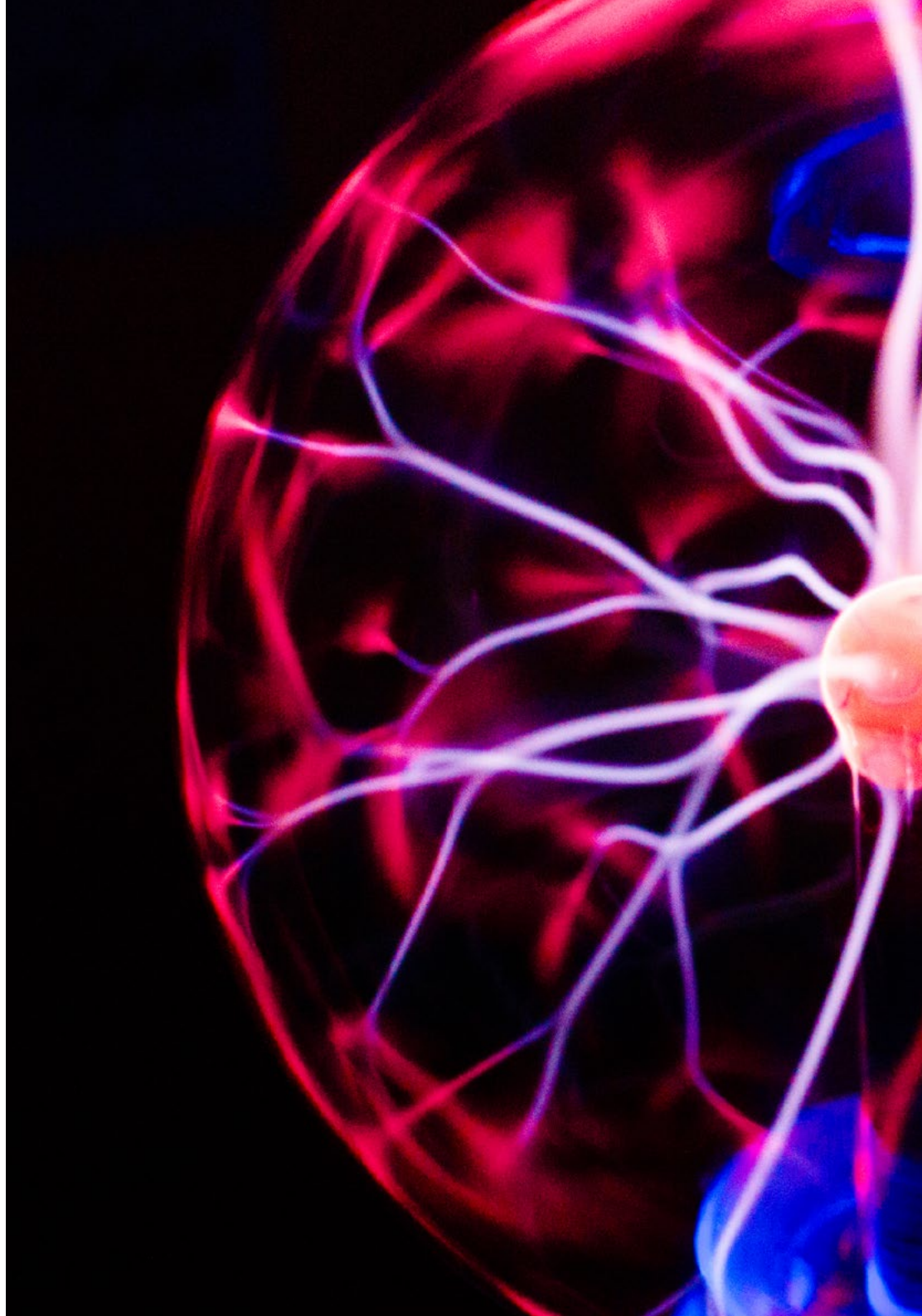


General Objectives

- ♦ Delve into Collectivities Theories
- ♦ Understand the theory of stochastic processes
- ♦ Become familiar with the elementary kinetic theory of transport processes



*Enroll now in a university
program that will apply the
Kinetic Theory of Collectivities"*





Specific Objectives

- ♦ Be able to apply the theory of collectivities to the study of ideal and interacting systems, including phase transitions and critical phenomena
- ♦ Apply the theory of stochastic processes to simple cases
- ♦ Know how to apply the elementary kinetic theory of transport processes to dilute gases and quantum gases

03

Structure and Content

The effectiveness of the Relearning System, based on the reiteration of content, has led TECH to include it in all its programs. Thanks to it, the graduates will be able to deepen over 6 weeks in the key concepts of Statistical Physics and its direct applications in the field of Engineering. Likewise, in this stage of knowledge acquisition, students will have access to innovative multimedia resources that they can access whenever they wish, from any device with an Internet connection. All this will lead them to master stochastic processes, the problem of specific heats in gases or the elementary kinetic theory of gases.





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With the Relearning method used in this Postgraduate Diploma you will be able to reduce the long hours of study so frequent in other teaching methods"

Module 1. Statistical Physics

- 1.1. Stochastic Processes
 - 1.1.1. Introduction
 - 1.1.2. Brownian Motion
 - 1.1.3. Random Walk
 - 1.1.4. Langevin Equation
 - 1.1.5. Fokker-Planck Equation
 - 1.1.6. Brownian Engines
- 1.2. Review of Statistical Mechanics
 - 1.2.1. Collectivities and Postulates
 - 1.2.2. Microcanonical Collectivity
 - 1.2.3. Canonical Collectivity
 - 1.2.4. Discrete and Continuous Energy Spectra
 - 1.2.5. Classical and Quantum Limits. Thermal Wavelength
 - 1.2.6. Maxwell-Boltzmann Statistics
 - 1.2.7. Energy Equipartition Theorem
- 1.3. Ideal Gas of Diatomic Molecules
 - 1.3.1. The Problem of Specific Heats in Gases
 - 1.3.2. Internal Degrees of Freedom
 - 1.3.3. Contribution of Each Degree of Freedom to the Heat Capacity
 - 1.3.4. Polyatomic Molecules
- 1.4. Magnetic Systems
 - 1.4.1. Spin Systems $\frac{1}{2}$
 - 1.4.2. Quantum Paramagnetism
 - 1.4.3. Classical Paramagnetism
 - 1.4.4. Superparamagnetism
- 1.5. Biological Systems
 - 1.5.1. Biophysics
 - 1.5.2. DNA Denaturation
 - 1.5.3. Biological Membranes
 - 1.5.4. Myoglobin Saturation Curve. Langmuir Isotherm
- 1.6. Systems with Interaction
 - 1.6.1. Solids, Liquids, Gases
 - 1.6.2. Magnetic Systems. Ferro-Paramagnetic Transition
 - 1.6.3. Weiss Model
 - 1.6.4. Landau Model
 - 1.6.5. Ising's Model
 - 1.6.6. Critical Points and Universality
 - 1.6.7. Monte Carlo Method. Metropolis Algorithm
- 1.7. Quantum Ideal Gas
 - 1.7.1. Distinguishable and Indistinguishable Particles
 - 1.7.2. Microstates in Quantum Statistical Mechanics
 - 1.7.3. Calculation of the Macrocanonical Partition Function in an Ideal Gas
 - 1.7.4. Quantum Statistics: Bose-Einstein and Fermi-Dirac Statistics
 - 1.7.5. Ideal Gases of Bosons and Fermions
- 1.8. Ideal Boson Gas
 - 1.8.1. Photons. Black Body Radiation
 - 1.8.2. Phonons. Heat Capacity of the Crystal Lattice
 - 1.8.3. Bose-Einstein Condensation
 - 1.8.4. Thermodynamic Properties of Bose-Einstein Gas
 - 1.8.5. Critical Temperature and Density
- 1.9. Ideal Gas for Fermions
 - 1.9.1. Fermi-Dirac Statistics
 - 1.9.2. Electron Heat Capacity
 - 1.9.3. Fermion Degeneracy Pressure
 - 1.9.4. Fermi Function and Temperature
- 1.10. Elementary Kinetic Theory of Gases
 - 1.10.1. Dilute Gas in Equilibrium
 - 1.10.2. Transport Coefficients
 - 1.10.3. Thermal Conductivity of the Crystalline Lattice and Electrons
 - 1.10.4. Gaseous Systems Composed of Moving Molecules



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*Enroll in a 100% online program
that will lead you to master the
elementary kinetic theory of gases"*

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.



The background of the slide features a close-up, slightly blurred image of a drafting table. A wooden ruler is positioned horizontally across the upper portion of the frame. Below it, a metal compass is resting on a blue sheet of paper with white dashed lines. The entire image is partially obscured by a large, diagonal white shape that cuts across the lower right, creating a modern, geometric design.

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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.

“*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.



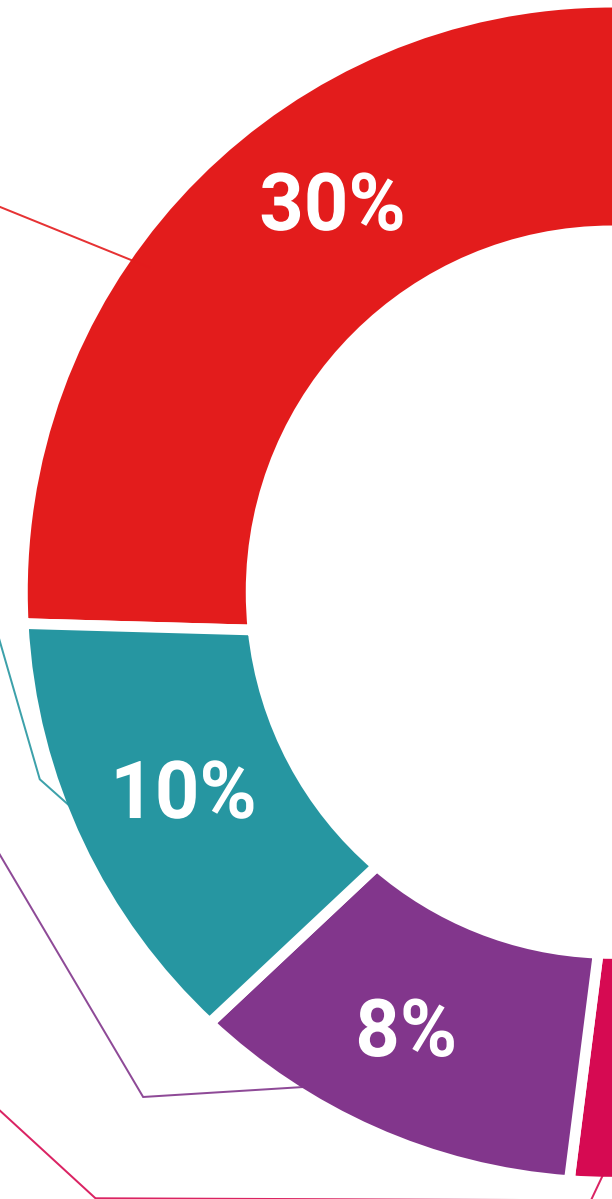
Practising Skills and Abilities

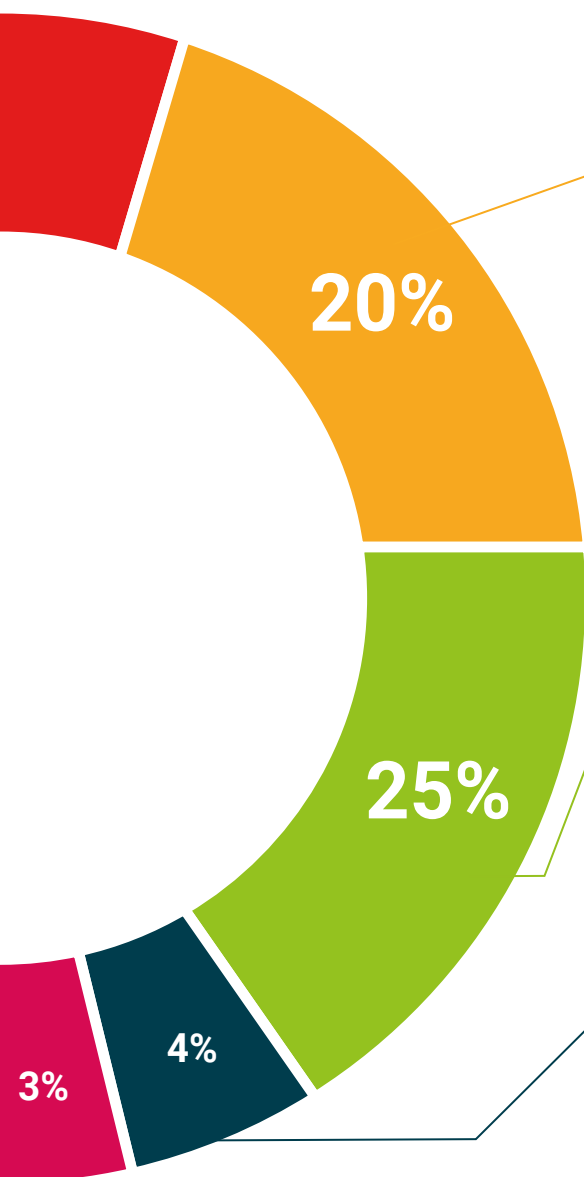
They will carry out activities to develop specific skills and abilities in each subject area. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop in the context of the globalization that we are experiencing.



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 Statistical Physics 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 Statistical Physics** 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 Statistical Physics**

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.



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