Postgraduate Certificate

Quantum Field Theory

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Postgraduate Certificate
Quantum Field Theory

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

Website: **www.techtitute.com/pk/engineering/postgraduate-certificate/quantum-field-theory**

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01

Introduction

Without Dirac, Schwinger, Pauli, Feynman or Dyson, quantum field theory developed in the 20th century would not make sense today. The complexity of quantum field theory does not mean its knowledge is unattainable or unnecessary for specialists from different disciplines, since its mastery has led to a better understanding of atoms or to the development of particle accelerators. These advances require qualified professionals who are in high demand by companies, due to staff shortage. In light of this reality, TECH has developed this 100% online teaching, in which students will delve into the classical electromagnetic field theory, its problems, symmetry or the study of muons and other charged particles. All this, in addition, through multimedia teaching resources that can be easily accessed 24 hours a day from any electronic device with Internet connection.

You will obtain in only 6 weeks, the knowledge you need about Quantum Field Theory to take a step further in the field of engineering"

The development of quantum electrodynamics by Richard Feynman, Julian Schwinger and Tomonaga earned them the Nobel Prize for Physics in 1965 and explains such common phenomena as light reflecting in a mirror or helps to understand the quarks and gluons that are so fundamental in today's physics. Unraveling the complexity of the functioning of the subatomic world is, even today, a challenge for scientists and specialists, and its development seems to be within the reach of only a few.

However, in order to achieve this goal, it is necessary to have solid knowledge, which will lead professionals to become part of the companies that demand such profiles to develop large-scale projects such as particle accelerators. In view of this, this 100% online program, which comes to respond to the current needs of all those engineering professionals who wish to progress in this field thanks to the advanced information.

A program that will help you, in just 6 weeks, to delve into the Klein-Gordon field, the Dirac equation, the electromagnetic field or how to draw Feynman diagrams. This will be possible thanks to video summaries detailed videos, outlines, specialized readings and case studies to which they will have access 24 hours a day, from any electronic device with Internet connection.

In addition, thanks to the Relearning method, the professionals will be able to progress through the program in a more natural and progressive way, even reducing the long hours of study. Thus, it will be easier to enter the world of symmetry, time inversion, parity or charge conjugation.

Thus, the professionals are facing an excellent opportunity to study a 100% online university program. There is no in-person attendance nor are there any fixed schedules, giving them the freedom to access the syllabus hosted on the virtual campus whenever and wherever they wish. An ideal educational option for those who are looking to combine their work and/or personal responsibilities with a quality program.

This **Postgraduate Certificate in Quantum Field Theory** 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

Access the library of multimedia resources of this program from your computer or tablet with Internet connection"

This Program will delve into the achievements of Dirac, Fock or Feynman in the development of Quantum Field Theory"

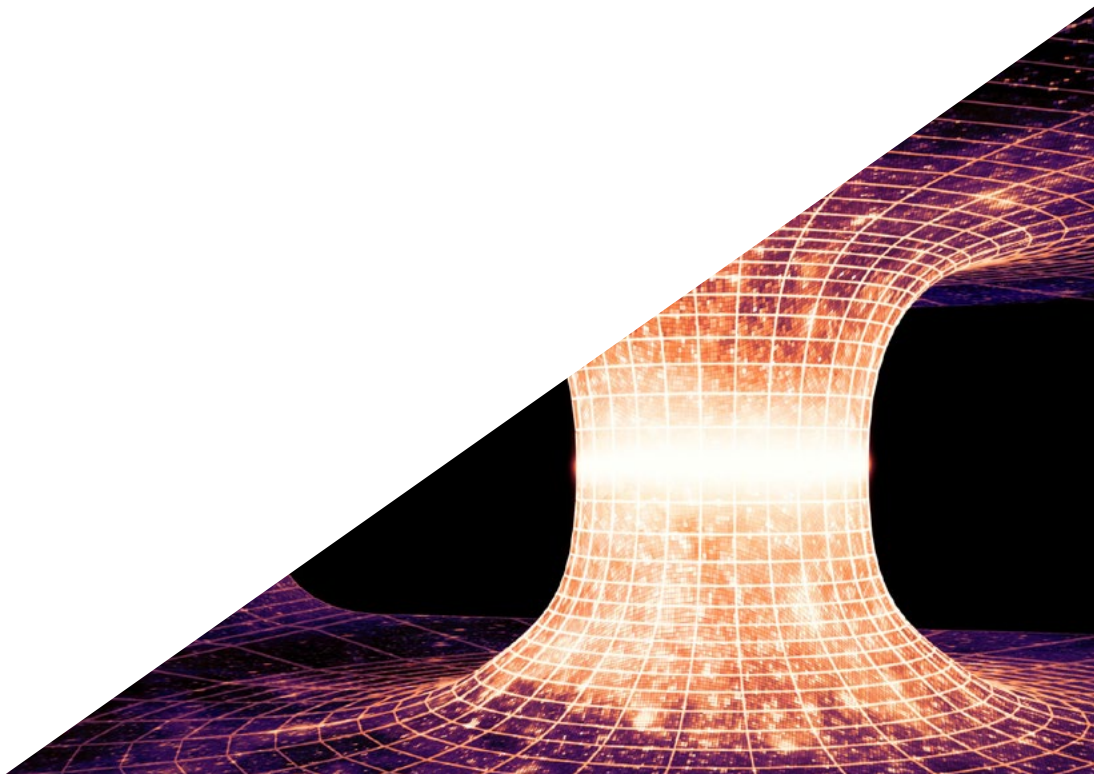
No in-person attendance or classes with fixed schedules, this university education is tailored to professionals like you.

Enroll in a university program that will allow you to easily understand the most common symmetry violations.

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.

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.

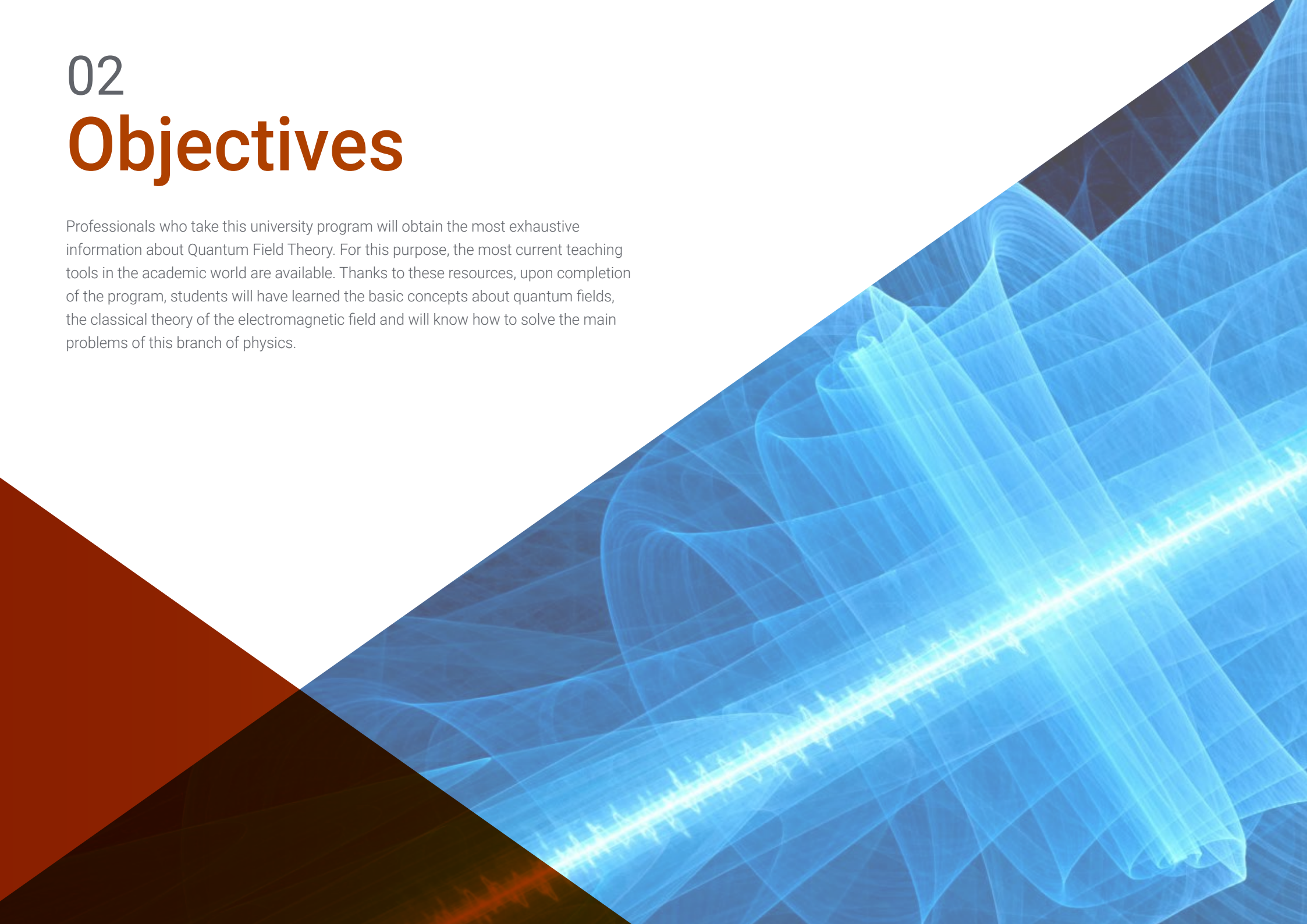
This program is designed around Problem-Based Learning, whereby the professional must try to solve the different professional practice situations that arise throughout the program. For this purpose, students will be assisted by an innovative interactive video system developed by renowned experts.



02

Objectives

Professionals who take this university program will obtain the most exhaustive information about Quantum Field Theory. For this purpose, the most current teaching tools in the academic world are available. Thanks to these resources, upon completion of the program, students will have learned the basic concepts about quantum fields, the classical theory of the electromagnetic field and will know how to solve the main problems of this branch of physics.

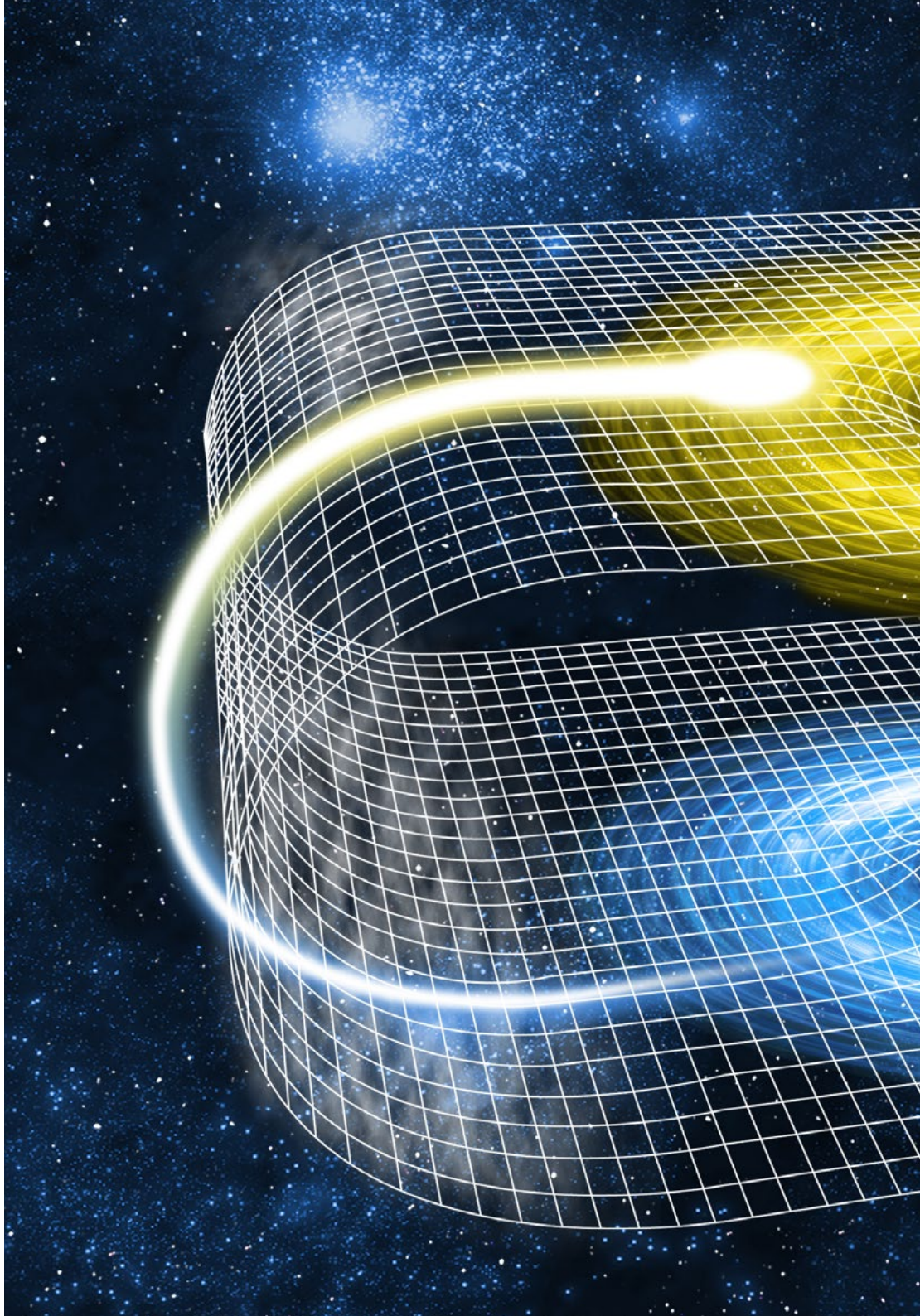


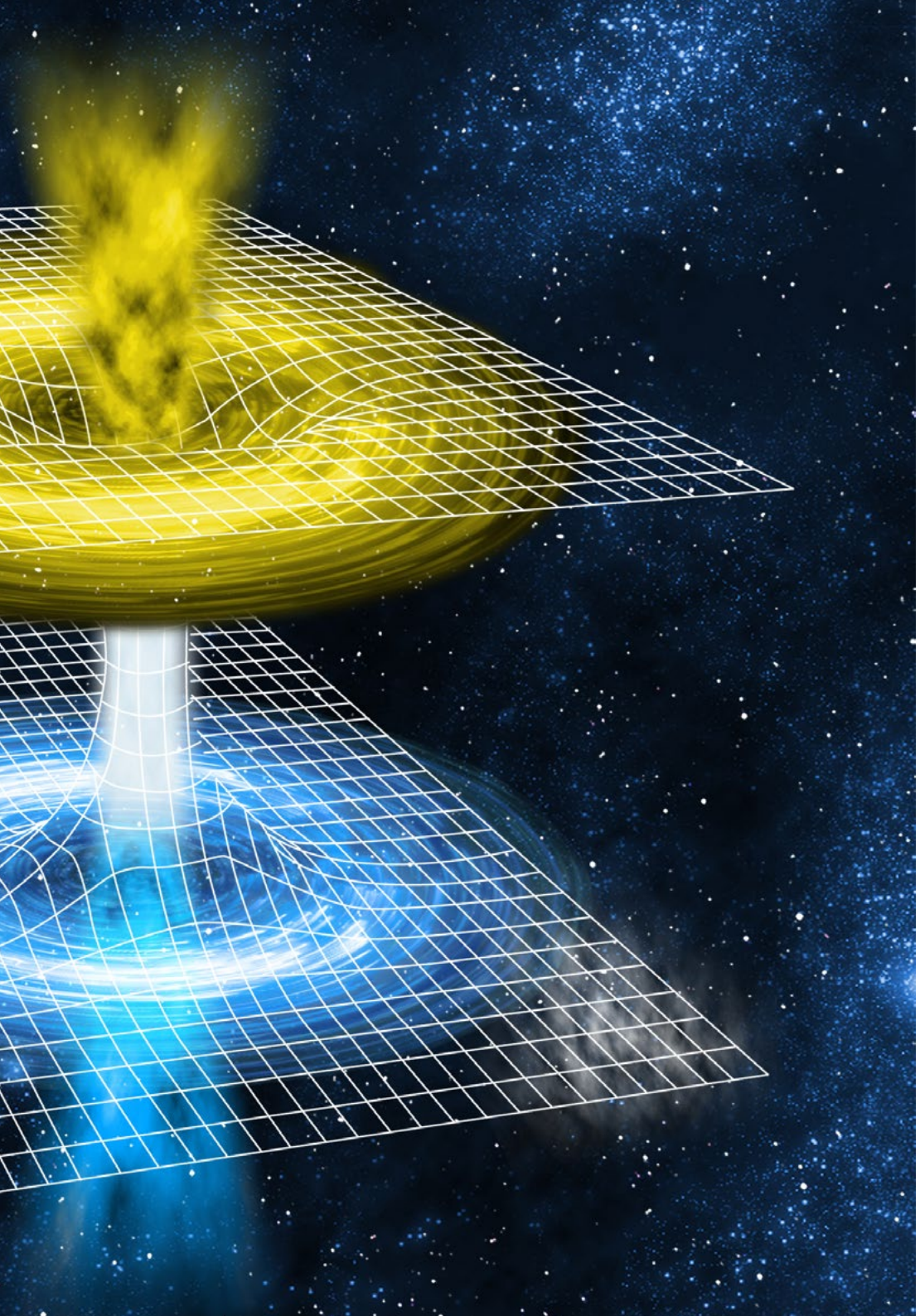
The case studies provided in this program will allow you to understand Quantum Field Theory in a much simpler way"

General Objectives

- Acquire basic notions of quantum field theory
- Know the main problems of quantization of some of the fields
- Understand the Classical Field Electromagnetic Theory

Would you like to master the Feynman Diagrams? With this Postgraduate Certificate, you will gain the knowledge you need, in a comfortable manner"





Specific Objectives

- Be able to solve the main problems of quantization
- know how to calculate amplitudes of interactions between particles from Feynman diagrams
- Know the C, P, T symmetries, the most common symmetry violations and the C, P, T symmetry conservation theorem

03

Structure and Content

This program designed by TECH offers the professionals the opportunity to gain in only 6 weeks, the advanced knowledge necessary to understand Quantum Field Theory. With this program, they will be able to progress in their professional field and apply the main concepts acquired about the Klein-Gordon field, the Dirac field or the Feynman diagram. In this sense, the practical case studies provided by the teaching staff of this program will be very useful for understanding these concepts.

With the Relearning system of this program, you will not need long hours of study and memorization"

Module 1. Quantum Field Theory

1.1. Classical Field Theory
- 1.1.1. Notation and Conventions
- 1.1.2. Lagrangian Formulation
- 1.1.3. Euler Lagrange Equations
- 1.1.4. Symmetries and Conservation Laws

1.2. Klein-Gordon Field
- 1.2.1. Klein-Gordon Equations
- 1.2.2. Klein-Gordon Field Quantization
- 1.2.3. Lorentz Invariance in the Klein-Gordon Field
- 1.2.4. Vacuum Vacuum and Fock States
- 1.2.5. Vacuum Energy
- 1.2.6. Normal Arrangement: Agreement
- 1.2.7. Energy and Momentum of States
- 1.2.8. Study of Causality
- 1.2.9. Klein-Gordon propagator

1.3. Dirac Field
- 1.3.1. Dirac Equation
- 1.3.2. Dirac Matrices and their Properties
- 1.3.3. Representation of Dirac Matrices
- 1.3.4. Dirac Lagrangian
- 1.3.5. Solution to Dirac Equation: Plane Waves
- 1.3.6. Commuting and Anticommuting
- 1.3.7. Quantification of Dirac Field
- 1.3.8. Fock Space
- 1.3.9. Dirac Propagator

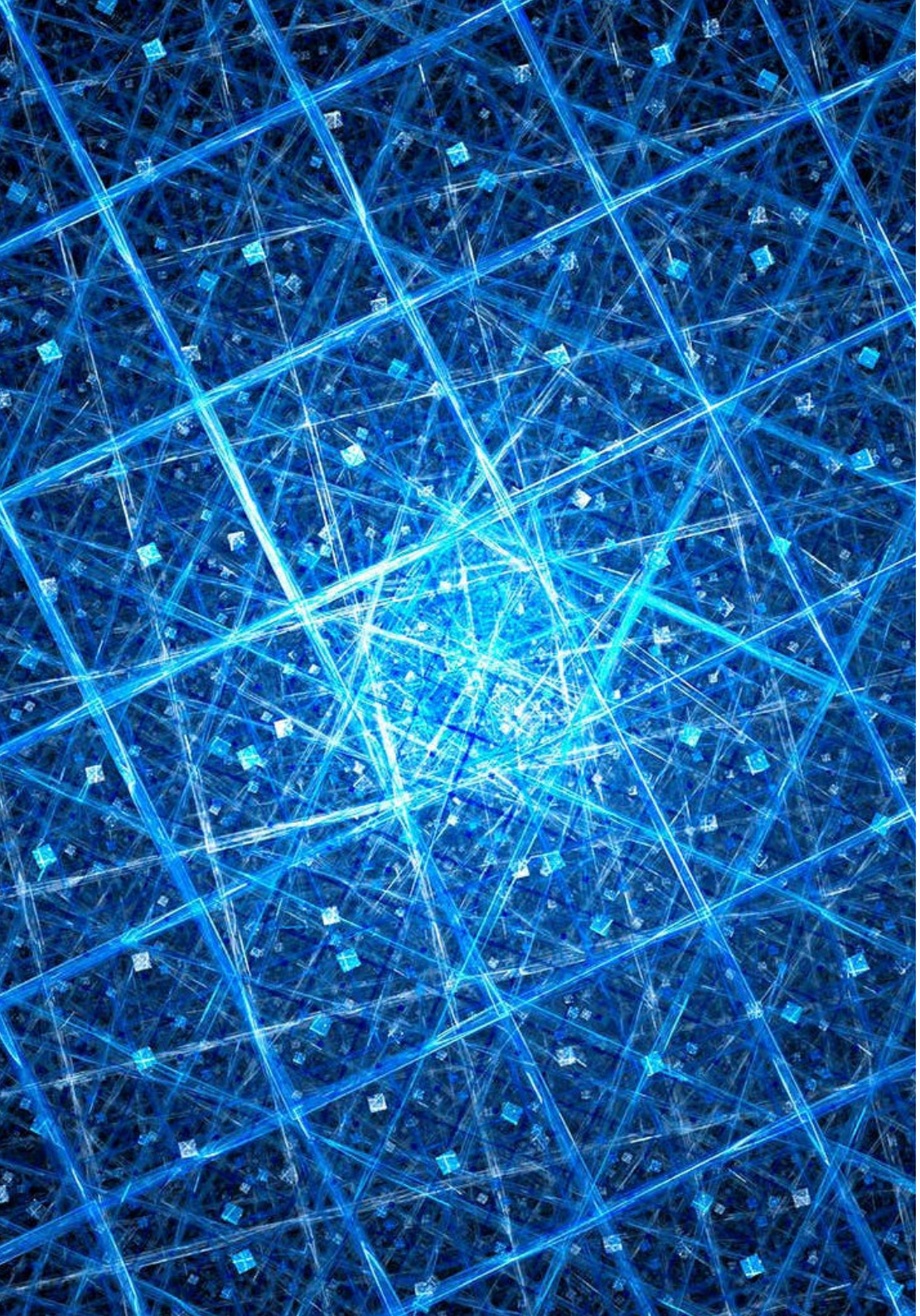
1.4. Electromagnetic Field
- 1.4.1. Classical Field Electromagnetic Theory
- 1.4.2. Quantization of the Electromagnetic Field and its Problems
- 1.4.3. Fock Space
- 1.4.4. Gupta-Bleuler Formalism
- 1.4.5. Photon Propagator

1.5. S-Matrix Formalism
- 1.5.1. Lagrangian and Hamitonian of Interaction
- 1.5.2. S Matrix: Definition and Properties
- 1.5.3. Dyson Expansion
- 1.5.4. Wick Theorem
- 1.5.5. Dirac Picture

1.6. Feinman Diagrams in the Position Space
- 1.6.1. How to Draw Feynman Diagrams: Standards and Uses
- 1.6.2. First Order
- 1.6.3. Second Order
- 1.6.4. Dispersion Processes with Two Particles

1.7. Feynman Rules
- 1.7.1. Normalization of States in Fock Space
- 1.7.2. Feynman Amplitude
- 1.7.3. Feynman Rules for QED
- 1.7.4. Gauge Invariance in the Amplitudes
- 1.7.5. Examples:

1.8. Cross Section and Decay Rates
- 1.8.1. Definition of Cross Sections
- 1.8.2. Definition of Decay Rate
- 1.8.3. Example with Two Bodies in Final State
- 1.8.4. Unpolarized Cross Section
- 1.8.5. Summation on Fermion Polarization
- 1.8.6. Summation on Photon Polarization
- 1.8.7. Examples:



1.9. Study of Muons and Other Charged Particles
- 1.9.1. Muons
- 1.9.2. Charged Particles
- 1.9.3. Scalar Charged Particles
- 1.9.4. Feynman Rules for Scalar Quantum Electrodynamics Theory

1.10. Symmetries
- 1.10.1. Parity
- 1.10.2. Load Conjugation
- 1.10.3. Time Reversal
- 1.10.4. Violation of Some Symmetries
- 1.10.5. CPT Symmetry

Enroll in an online program that gives you the opportunity to delve into the electromagnetic field through innovative multimedia resources"

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.

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

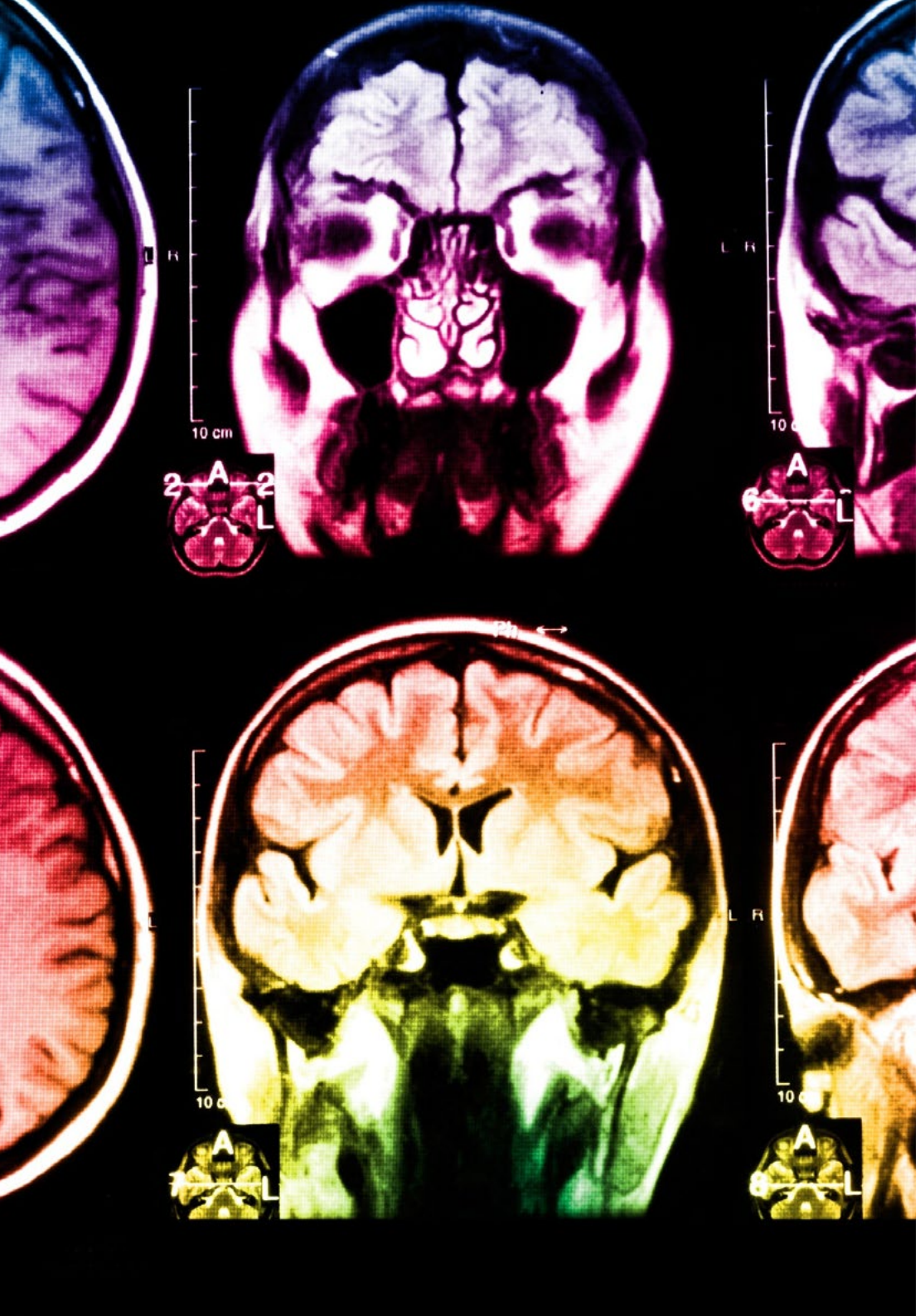
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

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.

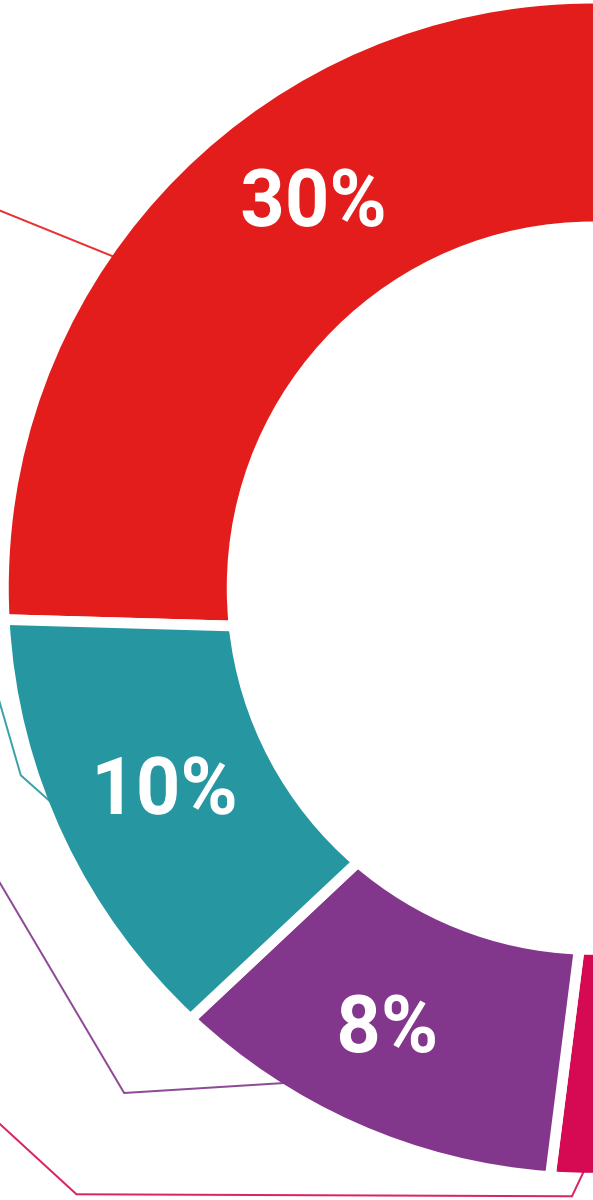
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

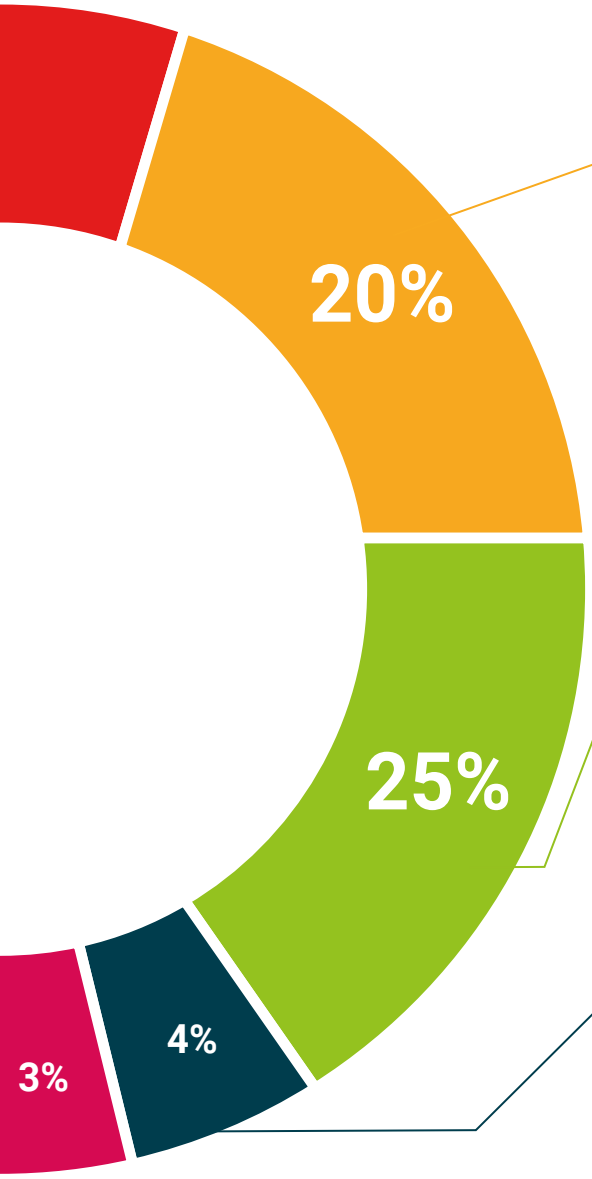
Practising Skills and Abilities

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

This Postgraduate Certificate in Quantum Field Theory guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Technological University.

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

This **Postgraduate Certificate in Quantum Field Theory** 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 Quantum Field Theory**

Official N° of hours: **150 h.**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Awards the following

CERTIFICATE

to

Mr./Ms. _____, with identification number _____.

For having passed and accredited the following program

POSTGRADUATE CERTIFICATE

in

Quantum Field Theory

This is a qualification awarded by this University, equivalent to 150 hours, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH is a Private Institution of Higher Education recognized by the Ministry of Public Education as of June 28, 2018.

June 17, 2020

Tere Guevara Navarro

Dean

This qualification must always be accompanied by the university degree issued by the competent authority to practice professionally in each country. Unique TECH Code: AFWORD23S techtitute.com/certificates

*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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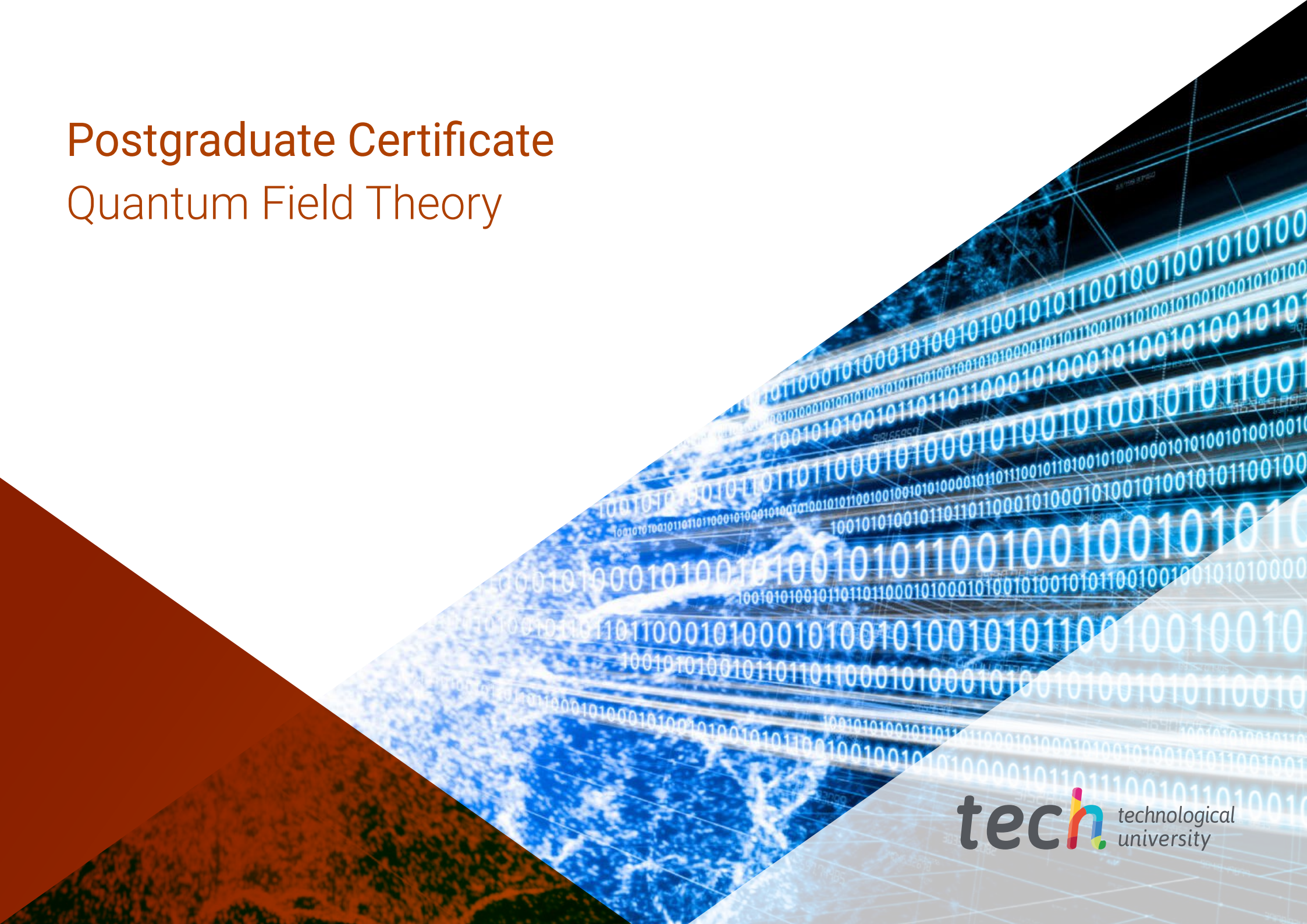

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