Postgraduate Diploma

Radiophysics Applied to Nuclear Medicine

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Postgraduate Diploma
Radiophysics Applied to Nuclear Medicine

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

Website: **www.techtitute.com/in/engineering/postgraduate-diploma/postgraduate-diploma-radiophysics-applied-nuclear-medicine**

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01

Introduction

With the constant expansion of medical technologies, there is a growing demand for professionals specialized in Radiophysics Applied to Nuclear Medicine. In this context, there is an urgent need for engineers trained to face the challenges and take advantage of the emerging opportunities in this dynamic field. The constant evolution of gamma cameras, PET and other devices requires experts in Radiophysics who thoroughly understand the physical basis and are able to address the radiological risks present in hospital facilities. This rapid change creates a growing labor demand, providing professionals with the opportunity to contribute significantly and excel in the Medical Engineering sector. And all this, with a 100% online approach.

With this 100% online university program, you will master the quality control of Nuclear Medicine equipment"

In a context of rapid advances in medical technologies, Radiophysics Applied to Nuclear Medicine presents itself as an essential field for engineers looking to stay current and relevant in the industry. The continuous evolution of clinical technology devices demands trained professionals who understand the complexities of international quality control protocols and can apply this knowledge in the efficient design of radioactive facilities.

As such, the syllabus of the Postgraduate Diploma in Radiophysics Applied to Nuclear Medicine will focus on Radiobiology, analyzing the cellular and biological effects triggered by radiation and diving into tissue sensitivity, radiation-induced injury and repair processes. The engineers will also delve into the world of radiopharmaceuticals in Nuclear Medicine, unraveling their uses for both diagnosis and treatment.

Likewise, they will delve into the fundamental equipment in hospitals, from activimeters to gamma cameras and PET, breaking down their parts, operation and imaging techniques. Next, the professionals will address the international regulations on radiological protection, as well as their practical application in the hospital environment. With special emphasis on Nuclear Medicine, Radiation Oncology and Radiodiagnosis, the importance of safeguarding patients and health professionals will be discussed.

This program is presented as a unique opportunity for working professionals who wish to enhance their skills and knowledge, without compromising their professional and personal lives. With a 100% online methodology, students will be able to access the contents from anywhere, adapting the learning to their schedules. In addition, the application of the *Relearning* method reinforces the retention of key concepts, ensuring a deep and lasting understanding of the topics covered.

This **Postgraduate Diploma in Radiophysics Applied to Nuclear Medicine** 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 Radiophysics Applied to Nuclear Medicine
- The graphic, schematic and practical contents with which it is conceived provide cutting- Therapeutics and practical information on those 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

Step into a world-class educational experience that will elevate your professional horizons in the field of Nuclear Medicine"

6 months of stimulating learning that will lead you to understand the design of a radioactive facility in a hospital environment"

Take advantage of this unique opportunity and take the plunge! You will get up to date on the physical basis of gamma camera and PET operation.

The revolutionary Relearning methodology, used in this program, will allow you to acquire knowledge and skills in an autonomous and progressive way.

The program includes in its teaching staff professionals from the sector who bring to this training the experience of their work, as well as renowned specialists from reference societies and prestigious universities.

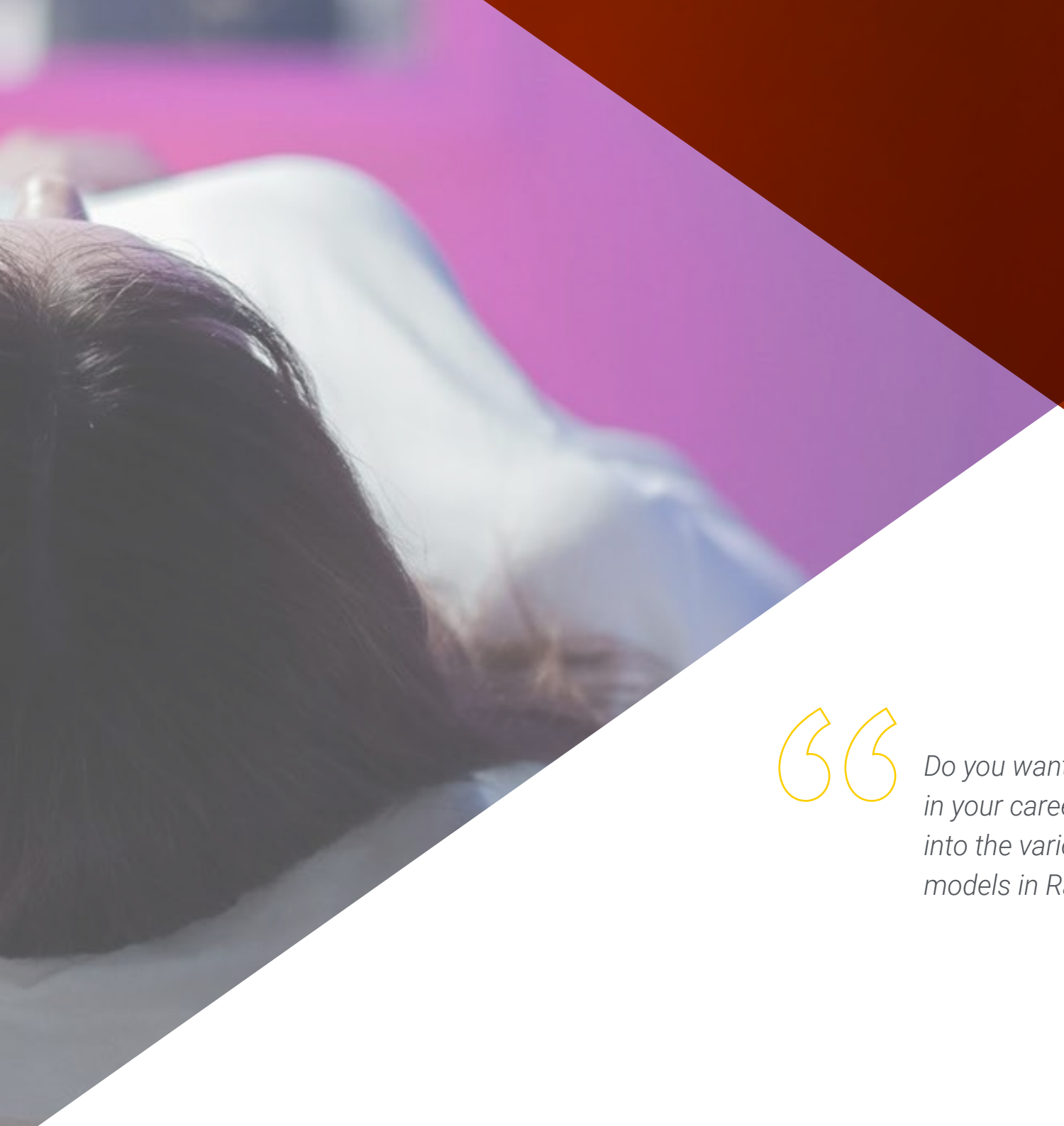
The multimedia content, developed with the latest educational technology, will provide the professional with situated and contextual learning, i.e., a simulated environment that will provide immersive education programmed to learn in real situations.

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 fundamental purpose of this university program is for the engineer to acquire in-depth knowledge of Radiobiology, specialized instrumentation in Nuclear Medicine and radiological safety. In other words, their main task will be to ensure the accuracy of diagnoses and the efficacy of treatments, with a focus on minimizing risks and maximizing safety, both for patients and medical personnel. In this way, this specialized approach will contribute to the advancement and excellence in the management of radioprotection in the field of engineering applied to Nuclear Medicine.



Do you want to experience a quality leap in your career? With TECH you will delve into the various existing mathematical models in Radiobiology"

General Objectives

- Analyze the basic interactions of ionizing radiation with tissues
- Establish the effects and risks of ionizing radiation at the cellular level
- Develop the existing mathematical models and their differences
- Determine the cellular response to various medical exposures
- Compile the instrumentation of a Nuclear Medicine Service
- Acquire knowledge of gamma cameras and PET scanners
- Investigate the operation of both tomographs based on quality control
- Develop more advanced concepts of dosimetry in patients
- Analyze the existing risks derived from the use of ionizing radiation in hospital radioactive facilities
- Delve into the international regulations applicable to radiation protection
- Specify the main safety actions in the use of ionizing radiation
- Generate the appropriate knowledge for the design and management of shielding

You will achieve your goals by taking advantage of the cutting-edge technological and educational tools that TECH offers you"

Specific Objectives

Module 1. Radiobiology

- Assess the risks associated with the main medical exposures
- Analyze the interaction of ionizing radiation with tissues and organs
- Examine the various mathematical models available in radiobiology
- Establish the parameters affecting the biological response to ionizing radiation

Module 2. Nuclear Medicine

- Distinguish between modes of image acquisition from a patient with a radiopharmaceutical
- Fundamentals of the physical basis of gamma camera and PET performance
- Determine the quality controls between gamma cameras and PET
- Develop knowledge of the MIRD methodology in patient dosimetry

Module 3. Radiation Protection in Hospital Radioactive Facilities

- Determine the radiological risks present in hospital facilities
- Identify the main international laws governing radiological protection
- Develop the main actions carried out at the radiation protection level
- Establish the concepts applicable to the design of a radioactive facility

03

Course Management

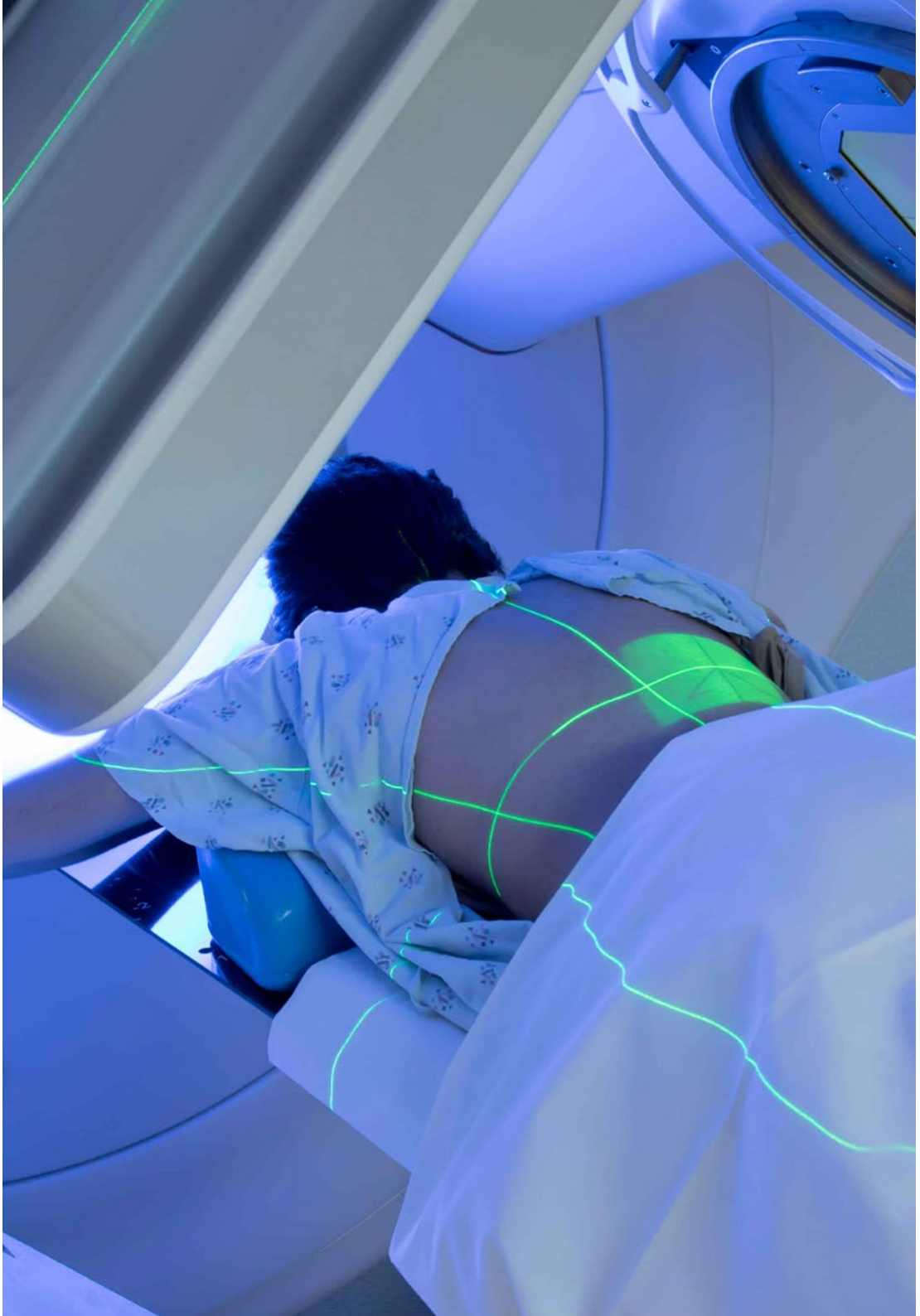
In the configuration of the teaching staff of the Postgraduate Diploma in Radiophysics Applied to Nuclear Medicine, TECH has brought together distinguished specialists with an extensive and recognized professional background in this field. Each member of this select team brings not only their experience, but also an unwavering commitment to excellence and innovation in the field of Radiophysics. This group of experts will provide graduates with solid, practical guidance based on real-world experience and expertise, preparing them to meet the current and future challenges of Medical Engineering.

You will have access to a syllabus designed by a reputable teaching staff, which will guarantee you a successful learning"

Management

Dr. De Luis Pérez, Francisco Javier

- Specialist in Hospital Radiophysics
- Head of the Radiophysics and Radiological Protection Service at Quirónsalud Hospitals in Alicante, Torrevieja and Murcia
- Research Group in Personalized Multidisciplinary Oncology, Catholic University San Antonio of Murcia
- PhD in Applied Physics and Renewable Energies, University of Almeria
- Degree in Physical Sciences, specializing in Theoretical Physics, University of Granada
- Member of: Spanish Society of Medical Physics (SEFM), Royal Spanish Society of Physics (RSEF), Illustrious Official College of Physicists and Consulting and Contact Committee, Proton Therapy Center (Quirónsalud)



Professors

Dr. Irazola Rosales, Leticia

- Specialist in Hospital Radiophysics
- Physician in Hospital Radiophysics at the Biomedical Research Center of La Rioja
- Working group on Lu-177 treatments at the Spanish Society of Medical Physics (SEFM)
- Collaborator at the University of Valencia
- Reviewer of the journal Applied Radiation and Isotopes
- International PhD in Medical Physics, University of Seville, Spain
- Professional Master's Degree in Medical Physics from the University of Rennes I
- Degree in Physics from the University of Zaragoza
- Member of: European Federation of Organizations in Medical Physics (EFOMP) and Spanish Society of Medical Physics (SEFM)

Dr. Rodríguez, Carlos Andrés

- Specialist in Hospital Radiophysics
- Physician in Hospital Radiophysics at the University Clinical Hospital of Valladolid, responsible for the Nuclear Medicine section
- Principal Tutor of residents of the Department of Radiophysics and Radiological Protection of the University Clinical Hospital of Valladolid
- Degree in Hospital Radiophysics
- Degree in Physics at the University of Salamanca

04

Structure and Content

Throughout this innovative academic pathway, professionals will be immersed in an intensive specialization that will allow them to delve into the physical basis of the operation of fundamental equipment, such as gamma cameras and PET. This detailed approach will extend to the ability to determine specific quality controls for these devices, giving graduates essential knowledge for the efficient and safe management of crucial technologies in the field of Nuclear Medicine. This program represents a unique opportunity to acquire specialized skills that will enhance professional work in the field of Medical Engineering.

You will explore emerging technologies that are transforming the landscape of Nuclear Medicine, through 450 hours of the best digital educational content"

Module 1. Radiobiology

1.1. Interaction of Radiation with Organic Tissues
- 1.1.1. Interaction of Radiation with Tissues
- 1.1.2. Interaction of Radiation with the Cell
- 1.1.3. Physicochemical Response

1.2. Effects of Ionizing Radiation on DNA
- 1.2.1. Structure of ADN
- 1.2.2. Radiation-Induced Damage
- 1.2.3. Damage Repair

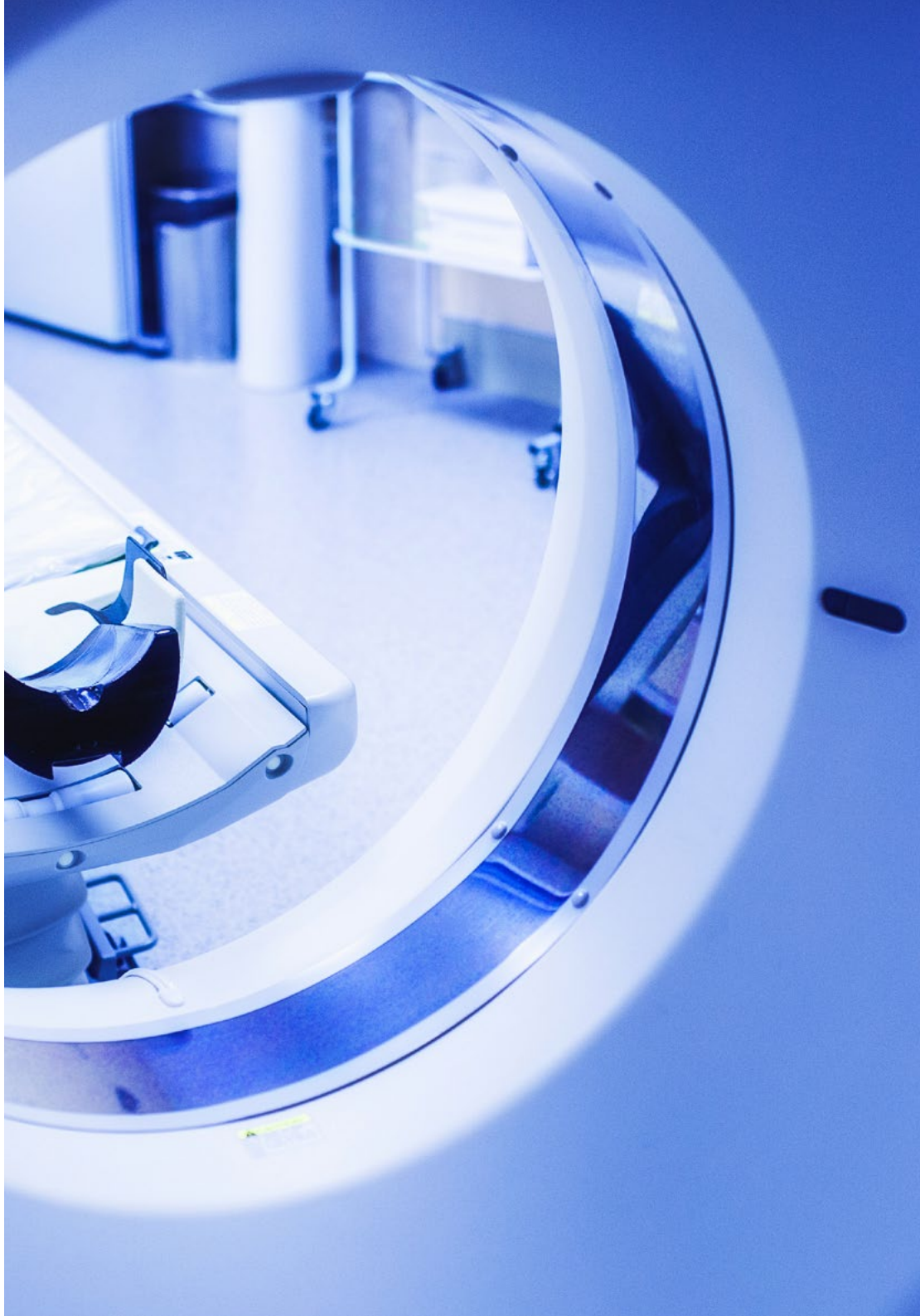
1.3. Radiation Effects on Organic Tissues
- 1.3.1. Effects on the Cell Cycle
- 1.3.2. Irradiation Syndromes
- 1.3.3. Aberrations and Mutations

1.4. Mathematical Models of Cell Survival
- 1.4.1. Mathematical Models of Cell Survival
- 1.4.2. Alpha-Beta Model
- 1.4.3. Effect of Fractionation

1.5. Efficacy of Ionizing Radiation on Organic Tissues
- 1.5.1. Relative Biological Efficacy
- 1.5.2. Factors Altering Radiosensitivity
- 1.5.3. LET and Oxygen Effect

1.6. Biological Aspects According to the Dose of Ionizing Radiations
- 1.6.1. Radiobiology at Low Doses
- 1.6.2. Radiobiology at High Doses
- 1.6.3. Systemic Response to Radiation

1.7. Estimation of the Risk of Ionizing Radiation Exposure
- 1.7.1. Stochastic and Random Effects
- 1.7.2. Risk Estimation
- 1.7.3. ICRP Dose Limits



1.8. Radiobiology in Medical Exposures in Radiotherapy
- 1.8.1. Isoeffect
- 1.8.2. Proliferation Effect
- 1.8.3. Dose-Response

1.9. Radiobiology in Medical Exposures in Other Medical Exposures
- 1.9.1. Brachytherapy
- 1.9.2. Radiodiagnostics
- 1.9.3. Nuclear Medicine

1.10. Statistical Models in Cell Survival
- 1.10.1. Statistical Models
- 1.10.2. Survival Analysis
- 1.10.3. Epidemiological Studies

Module 2. Nuclear Medicine

2.1. Radionuclides used in Nuclear Medicine
- 2.1.1. Radionuclides
- 2.1.2. Typical Diagnostic Radionuclides
- 2.1.3. Typical Radionuclides in Therapy

2.2. Obtaining Artificial Radionuclides
- 2.2.1. Nuclear Reactor
- 2.2.2. Cyclotron
- 2.2.3. Generators

2.3. Instrumentation in Nuclear Medicine
- 2.3.1. Activimeters. Calibration of Activimeters
- 2.3.2. Intraoperative Probes
- 2.3.3. Gammacameras and SPECT
- 2.3.4. PET:

2.4. Quality Assurance Program in Nuclear Medicine
- 2.4.1. Quality Assurance in Nuclear Medicine
- 2.4.2. Acceptance, Reference and Consistency Tests
- 2.4.3. Good Practice Routine

2.5. Nuclear Medicine Equipment: Gamma Cameras
- 2.5.1. Image Formation
- 2.5.2. Image Acquisition Modes
- 2.5.3. Standard Protocol for a Patient

2.6. Nuclear Medicine Equipment: SPECT
- 2.6.1. Tomographic Reconstruction
- 2.6.2. Synogram
- 2.6.3. Reconstruction Corrections

2.7. Nuclear Medicine equipment: PET:
- 2.7.1. Physical Basis
- 2.7.2. Detector Material
- 2.7.3. 2D and 3D Acquisition. Sensitivity
- 2.7.4. Time of Flight

2.8. Image Reconstruction Corrections in Nuclear Medicine
- 2.8.1. Attenuation Correction
- 2.8.2. Dead Time Correction
- 2.8.3. Random Event Correction
- 2.8.4. Scattered Photon Correction
- 2.8.5. Standardization
- 2.8.6. Image Reconstruction

2.9. Quality Control of Nuclear Medicine Equipment
- 2.9.1. International Guidelines and Protocols
- 2.9.2. Planar Gamma Cameras
- 2.9.3. Tomographic Gamma Cameras
- 2.9.4. PET:

2.10. Dosimetry in Nuclear Medicine Patients
- 2.10.1. MIRD Formalism
- 2.10.2. Estimation of Uncertainties
- 2.10.3. Erroneous Administration of Radiopharmaceuticals

Module 3. Radiation Protection in Hospital Radioactive Facilities

3.1. Hospital Radiation Protection
- 3.1.1. Hospital Radiation Protection
- 3.1.2. Radiation Protection Magnitudes and Specialized Radiation Protection Units
- 3.1.3. Risks Specific to the Hospital Area

3.2. International Regulations on Radiation Protection
- 3.2.1. International Legal Framework and Authorizations
- 3.2.2. International Regulations on Health Protection against Ionizing Radiations
- 3.2.3. International Regulations on Radiological Protection of the Patient
- 3.2.4. International Regulations on the Specialty of Hospital Radiophysics
- 3.2.5. Other International Regulations

3.3. Radiation Protection in Hospital Radioactive Facilities
- 3.3.1. Nuclear Medicine
- 3.3.2. Radiodiagnostics
- 3.3.3. Radiotherapy Oncology

3.4. Dosimetric Control of Exposed Professionals
- 3.4.1. Dosimetric Control
- 3.4.2. Dose Limits
- 3.4.3. Personal Dosimetry Management

3.5. Calibration and Verification of Radiation Protection Instrumentation
- 3.5.1. Calibration and Verification of Radiation Protection Instrumentation
- 3.5.2. Verification of Environmental Radiation Detectors
- 3.5.3. Verification of Surface Contamination Detectors

3.6. Control of the Airtightness of Encapsulated Radioactive Sources
- 3.6.1. Control of the Airtightness of Encapsulated Radioactive Sources
- 3.6.2. Methodology
- 3.6.3. International Limits and Certificates

3.7. Design of Structural Shielding in Medical Radioactive Facilities
- 3.7.1. Design of Structural Shielding in Medical Radioactive Facilities
- 3.7.2. Important Parameters
- 3.7.3. Thickness Calculation

3.8. Structural Shielding Design in Nuclear Medicine
- 3.8.1. Structural Shielding Design in Nuclear Medicine
- 3.8.2. Nuclear Medicine Installations
- 3.8.3. Workload Calculation

3.9. Design of Structural Shielding in Radiotherapy
- 3.9.1. Design of Structural Shielding in Radiotherapy
- 3.9.2. Radiotherapy Facilities
- 3.9.3. Workload Calculation

3.10. Structural Shielding Design in Radiodiagnostics
- 3.10.1. Structural Shielding Design in Radiodiagnostics
- 3.10.2. Radiodiagnostic Installations
- 3.10.3. Workload Calculation

Enroll in a flexible degree program that is compatible with your most demanding daily responsibilities"

05

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

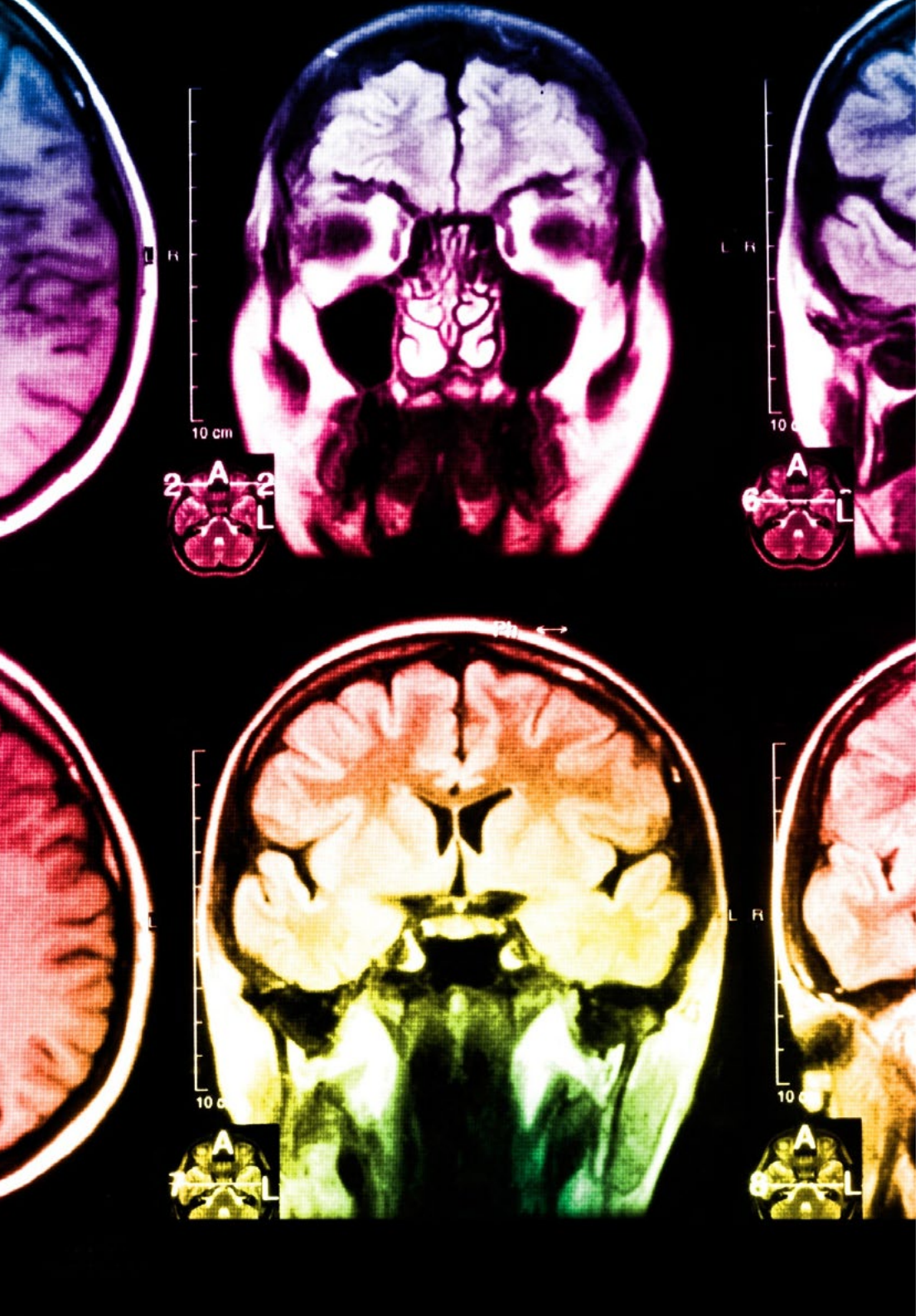
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

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.

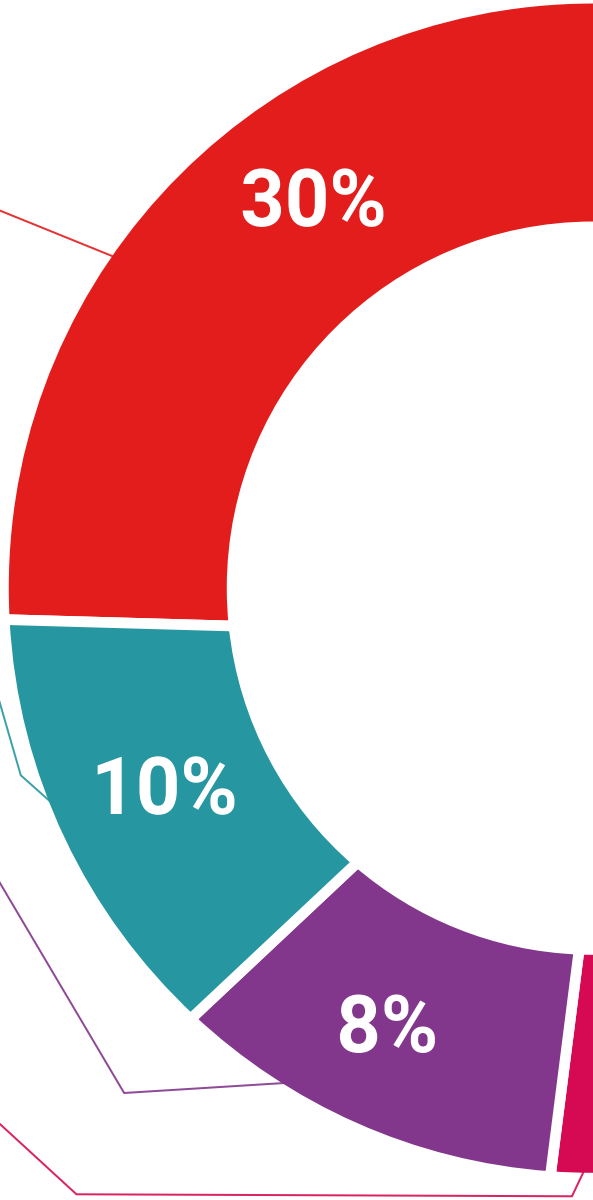
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

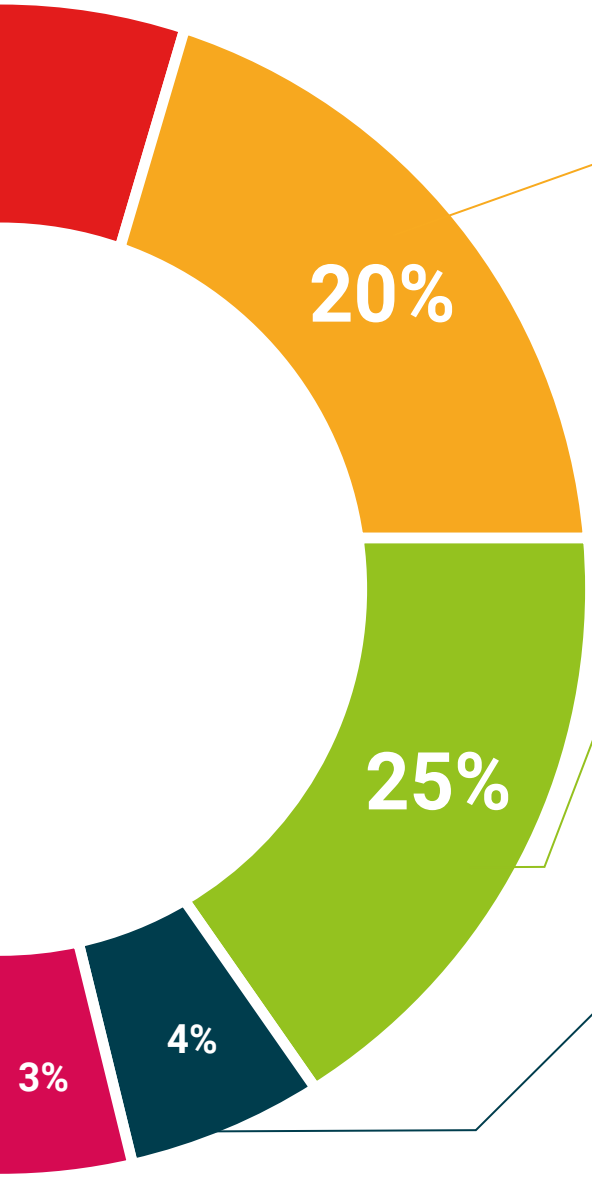
Practising Skills and Abilities

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.

06

Certificate

The Postgraduate Diploma in Radiophysics Applied to Nuclear Medicine guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Diploma issued by TECH Technological University.

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

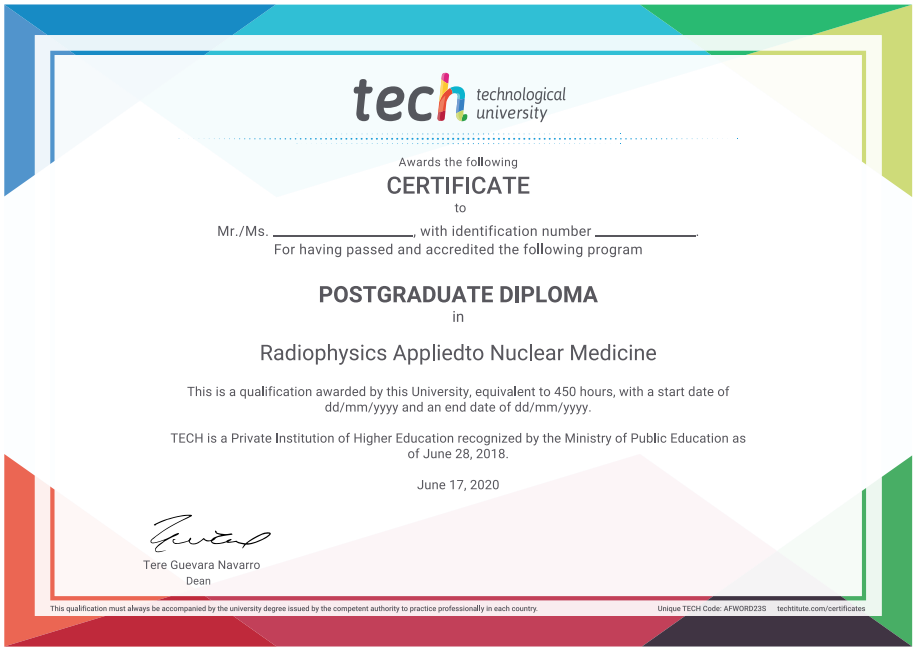
This **Postgraduate Diploma in Radiophysics Applied to Nuclear Medicine** contains the most complete and up-to-date program on the market.

After the student has passed the assessments, they will receive their corresponding **Postgraduate Diploma** issued by **TECH Technological University** via tracked delivery*.

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

Title: **Postgraduate Diploma in Radiophysics Applied to Nuclear Medicine**

Official Nº of Hours: **450 h.**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Awards the following

CERTIFICATE

to

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

For having passed and accredited the following program

POSTGRADUATE DIPLOMA

in

Radiophysics Appliedto Nuclear Medicine

This is a qualification awarded by this University, equivalent to 450 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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