



## Postgraduate Diploma

## Nuclear Medicine in Pediatrics

» Modality: online

» Duration: 6 months

» Certificate: TECH Global University

» Credits: 18 ECTS

» Schedule: at your own pace

» Exams: online

Website: www.techtitute.com/us/medicine/postgraduate-diploma/postgraduate-diploma-nuclear-medicine-pediatrics

## Index

> 06 Certificate

> > p. 30





## tech 06 | Introduction

There are groups of the population that are particularly vulnerable. Children are one of them and, for this reason, more and more avenues are being explored to provide them with adequate treatment and diagnosis. One of the new paths followed to achieve this objective is Nuclear Medicine, which offers the possibility of detecting numerous pathologies with great precision and providing the corresponding solution.

Thus, this area is one of the most demanded in medicine today, since it is an innovative discipline capable of responding to different conditions that can attack children. Thus, this Postgraduate Diploma in Nuclear Medicine in Pediatrics is the best way to provide patients with new treatments, achieving a significant professional advance thanks to what has been learned in this qualification.

Throughout this program, students will be able to delve into different aspects of this area applied to pediatric patients, such as gammagraphic studies and PET tracers, among many others. And they will achieve this thanks to TECH's innovative 100% online learning method, which focuses on practice and offers students the possibility to learn through the analysis of clinical cases.

This **Postgraduate Diploma in Nuclear Medicine in Pediatrics** contains the most complete and up-to-date educational program on the market. Its most notable features are:

- The development of case studies presented by experts in Nuclear Medicine and Pediatrics
- The graphic, schematic, and eminently 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



Pediatrics requires specialized treatments and Nuclear Medicine can offer numerous solutions. Enroll and advance professionally thanks to this qualification"



The way to remain a relevant professional is to update your knowledge. With this Postgraduate Diploma you will achieve it"

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.

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 training programmed to train 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 student will be assisted by an innovative interactive video system created by renowned and experienced experts.

Nuclear Medicine is the Present and the Future. Specialize and advance professionally.

Apply Nuclear Medicine to pediatrics and improve your patient's treatments.









## tech 10 | Objectives



## **General objectives**

- Update the specialist in Nuclear Medicine
- Perform and interpret functional tests in an integrated and sequential manner
- Achieve diagnostic guidance for patients
- \* Assist in deciding the best therapeutic strategy, including radiometabolic therapy, for each patient
- Apply clinical and biochemical criteria for the diagnosis of infections and inflammations
- Understand the particularities of Nuclear Medicine applied to pediatric patients
- Learn about the new therapies of Nuclear Medicine



Enroll and immediately see how you can make see how you can make significant career advancements"





### **Specific objectives**

#### Module 1. Nuclear Medicine in Pediatrics

- Delve into the specific characteristics of Nuclear Medicine studies in Pediatrics
- Cover aspects of test indication, acquisition protocols with appropriate choice of radiopharmaceutical and instrumentation characteristics
- Optimization of dosimetric parameters
- Interpret images and know the different pathologies by organs and systems and differential diagnosis
- Understand the best diagnostic strategy with proper sequencing of tests while minimizing radiation
- Avoid tests that do not provide information for the management of the child

#### Module 2. Infection/Inflammation

- Delve into the application of molecular and morphofunctional imaging techniques in the field of Nuclear Medicine in the diagnosis, assessment of the extent and response to treatment of infectious/inflammatory pathology in the different organs and systems
- Delve into the techniques applied in the specific clinical context
- Accurate diagnosis with the least consumption of resources and radiation for the patient

#### Module 3. Nuclear Medicine

 Delve into the knowledge of the basics of Nuclear Medicine in its fundamental elements, such as radioactivity and the type of disintegrations, image detection and generation, radiopharmaceuticals and radioprotection







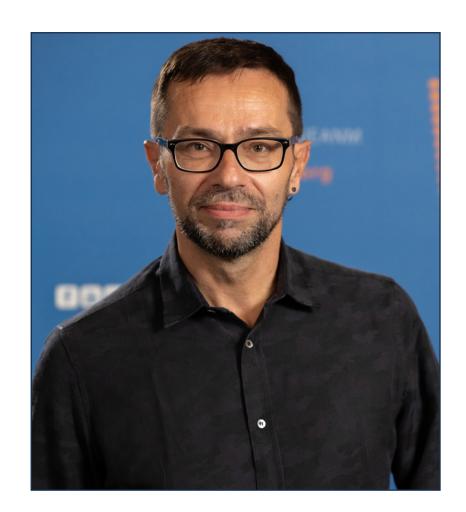
#### **International Guest Director**

Dr. Stefano Fanti's prominent career has been entirely devoted to **Nuclear Medicine**. For almost 3 decades he has been professionally linked to the **PET Unit** at the **Polyclinic S. Orsola**. His exhaustive management as **Medical Director** of that hospital service allowed an exponential growth of the same, both its facilities and equipment. As a result, in recent years the institution has performed more than **12,000 radiodiagnostic examinations**, making it one of the **most active** in **Europe**.

Based on these results, the expert was selected to **reorganize** the **functions** of all the metropolitan centers with Nuclear Medicine tools in the region of Bologna, Italy. After this intensive professional task, he has held the position of **Referent of the Maggiore Hospital Division**. Also, still in charge of the PET Unit, Dr. Fanti has coordinated several grant applications for this center, receiving important funding from national institutions such as the Italian **Ministry of Universities** and the **Regional Health Agency**, Ministry of Universities.

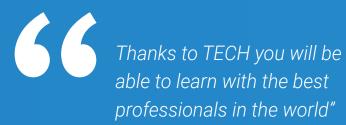
On the other hand, this specialist has participated in many research projects on the clinical application of PET and PET/CT technologies in Oncology. In particular, he has investigated the approach to Lymphoma and Prostate Cancer. In turn, he has integrated the teams of many clinical trials with BCP requirements. In addition, he personally leads experimental analyses in the field of new PET tracers, including C-Choline, F-DOPA and Ga-DOTA-NOC, among others.

Also, Dr. Fanti is a collaborator of the International Atomic Energy Organization (IAEA), participating in initiatives such as the consensus for the introduction of radiopharmaceuticals for clinical use and other advisory missions. He is also the author of more than 600 articles published in international journals and is a reviewer for The Lancet Oncology, The American Journal of Cancer, BMC Cancer, among others.



## Dr. Fanti, Stefano

- · Director of the Specialized School of Nuclear Medicine of the University of Bologna, Italy
- · Director of the Division of Nuclear Medicine and of the PET Unit of Polyclinic S. Orsola
- · Referent of the Division of Nuclear Medicine, Maggiore Hospital
- Associate Editor of Clinical and Translational Imaging, the European Journal of Nuclear Medicine and the Spanish Journal of Nuclear Medicine
- Reviewer for The Lancet Oncology, The American Journal of Cancer, BMC Cancer, European Urology,
   The European Journal of Hematology, Clinical Cancer Research, and other international journals
- · Advisor to the International Atomic Energy Organization (IAEA)
- · Member of: European Association of Nuclear Medicine



## tech 16 | Course Management

#### Management



#### Dr. Mitjavila, Mercedes

- · Head of Nuclear Medicine Service Puerta de Hierro University Hospital Majadahonda, Madrid
- · Project Manager of the Nuclear Medicine Unit in the Diagnostic Imaging Department of the Alcorcón Foundation University Hospital
- · Head of Service of Nuclear Medicine of the Puerta de Hierro Hospital Majadahonda. Competitive examination BOCM
- · Degree in Medicine and General Surgery from the University of Alcalá de Henares
- MIR in Nuclear Medicine Specialist by the MIR System
- · PhD in Medicine and General Surgery from the University of Alcalá de Henares
- Interim Physician of the Nuclear Medicine Service of the Ramón y Cajal Hospita
- · Interim Physician in the Nuclear Medicine Unit at Getafe University Hospital



## Course Management | 17 tech

#### **Professors**

#### Dr. García Cañamaque, Lina

- Head of Service, Sanchinarro Hospital
- Start-up of three Nuclear Medicine services (Nuestra Señora de América Hospital, Sanchinarro Hospital and Puerta del Sur Hospital)
- Specialist in Nuclear Medicine
- Official Doctoral Program in Biomedicine and Pharmacy San Pablo CEU University
- Supervisor of 2nd category radioactive facilities Nuclear Safety Council

#### Dr. Martí Climent, Josep M.

- Director of the Clinic's Radiophysics and Radiological Protection Service
- Navarra University
- Deputy Director of the Nuclear Medicine Service of the University Clinic of Navarra
- Graduate in Sciences (Autonomous University of Barcelona)
- D. in Sciences (Autonomous University of Barcelona)
- Specialist in Hospital Radiophysics (Ministry of Education and Science)

#### Dr. Rodríguez Alfonso, Begoña

- \* Elective Puerta de Hierro University Hospital
- Elective La Paz University Hospital
- Elective Ciudad Real General Hospital
- Degree in Medicine and Surgery from the Complutense University of Madrid
- Official Doctoral Program in Medicine and Surgery Autonomous University of Madrid





## tech 20 | Structure and Content

#### Module 1. Nuclear Medicine in Pediatrics

- 1.1. Pediatric Nuclear Medicine
  - 1.1.1. Management of the Child in Nuclear Medicine: Information to Parents and/or Guardians, Preparation and Scheduling, Appropriate Environments
  - 1.1.2. Dose Optimization
  - 1.1.3. Sedation and Anaesthesia
  - 1.1.4. Physical Aspects in Pediatric Patients: Image Acquisition and Processing
- 1.2. PET/PET-CT/PET-MRI in Pediatric and Young Adult Patients
  - 1.2.1. Protocol Optimization
  - 1.2.2. Indications
  - 1.2.3. Non-FDG Tracers
- 1.3. Central Nervous System/LCR
  - 1.3.1. Brain Maturation Patterns
  - 1.3.2. Epilepsy and Vascular Disorders
  - 1.3.3. Brain Tumors
  - 1.3.4. Hydrocephalus and Cerebrospinal Fluid Fistula
- 1.4. Endocrine
  - 1.4.1. Thyroid Pathology: Hypothyroidism, Hyperthyroidism, Thyroid Nodule
  - 1.4.2. Hyperinsulinism
- 1.5. Cardiopulmonary
  - 1.5.1. Congenital Heart Disease: Shunt Right-Left, Shunt Left-Right
  - 1.5.2. Bronchopulmonary Pathology: Congenital and Acquired
- 1.6. Gastrointestinal System
  - 1.6.1. Dynamic Esophagogastric Studies
  - 1.6.2. Gastroesophageal Reflux, Bronchopulmonary Aspiration
  - 1.6.3. Hepatobiliary Gammagraphy: Biliary Tract Atresia
  - 1.6.4. Intestinal Bleeding: Mekel's Diverticulum, Intestinal Duplication
- 1.7. Nephrourology
  - 1.7.1. Hydronephrosis Assessment
  - 1.7.2. Renal Cortical Assessment: in Infections, Ectopy
  - 1.7.3. Vesicoureteral Reflux: Diagnosis and Monitoring
  - 1.7.4. Others: Renal Malformations, Renal Transplantation, Kidney Transplantation

- 1.8. Osteoarticular System
  - 1.8. 1. Benign Lesions in Pediatric Patients: Fractures, Tumors
  - 1.8.2. Avascular Necrosis: Perthes' Disease and Others
  - 1.8.3. Sympathetic Reflex Dystrophy
  - 1.8.4. Low Back Pain
  - 1.8.5. Infection: Osteomyelitis, Spondylodiscitis
- 1.9. Neuroblastoma
  - 1.9.1. Diagnostic Studies: Bone Scintigraphy, MIBG and other PET Radiotracers
  - 1.9.2. Radiometabolic Treatment: MIBG, 177Lu-DOTATATE
- 1.10. Other Tumours
  - 1.10.1. Osteosarcoma: Diagnosis, Response Assessment and Monitoring
  - 1.10.2. Bone Tracers and 18F-FDG-PET/CT PET/CT Study
  - 1.10.3. Ewing's Disease: Diagnosis, Response Assessment and Monitoring
  - 1.10.4. Bone Tracers and 18F-FDG-PET/CT Study
  - 1.10.5. Lymphoma: 18F-FDG PET/CT in Diagnosis, Response Assessment, Monitoring
  - 1.10.6. Rhabdomyosarcoma and Soft Tissue Sarcomas: 18F-FDG PET/CT in Diagnosis, Response Assessment and Monitoring

#### Module 2. Infection/Inflammation: Gammagraphic Studies and PET Tracers

- 2.1. Osteoarticular
  - 2.1.1. Osteomyelitis: Previously Healthy Bone, Diabetic Patient, Spine Surgery
  - 2.1.2. Prosthesis: Septic vs. Aseptic Mobilization
- 2.2. Cardiac
  - 2.2.1. Endocarditis: Native Valve. Prosthetic Valve
  - 2.2.2. Myocarditis: Infectious vs. Inflammatory
  - 2.2.3. Intracardiac Devices
- 2.3. Vascular
  - 2.3.1. Inflammatory Vasculitis
  - 2.3.2. Prosthetic Graft Infection
- 2.4. Encephalitis: PET-FDG Study
  - 2.4.1. Paraneoplastic
  - 2.4.2. Infectious: Patterns and Differential Diagnosis



## Structure and Content | 21 tech

- 2.5. Fever of Unknown Origin
  - 2.5.1. Immunosuppressed Patients
  - 2.5.2. Postoperative Fever and Recurrent Sepsis
- 2.6. Systemic Disease
  - 2.6.1. Sarcoidosis: Diagnosis, Extent and Response to Treatment
  - 2.6.2. Ig4-related Disease
- 2.7. Other Locations
  - 2.7.1. Hepatorenal Polycystic Kidney Disease: Localization of the Infectious Focus
  - 2.7.2. Hepatobiliary: Post-surgical Patient
- 2.8. Covid-19
  - 2.8.1. Nuclear Medicine Studies in Acute Phase: Pulmonary Inflammation, Pulmonary Thromboembolism, Oncology Patient and Covid-19
  - 2.8.2. Utility of Nuclear Medicine in Postcovid Pathology: Pulmonary, Systemic
  - 2.8.3. Organizational Changes in a Pandemic Situation

#### Module 3. The Nuclear Medicine

- 3.1. Physical Bases of Ionizing Radiations
  - 3.1.1. Ionizing Radiation and Radioactive Isotopes
  - 3.1.2. Types of Radiation
- 3.2. Biological Effects of Ionizing Radiations
  - 3.2.1. Classification of Effects according to: Time of Cocurrence
  - 3.2.2. Biological and Dose Dependent Effect
  - 3.2.3. Interaction of Ionizing Radiation with Matter
  - 3.2.4. Ionizing Radiation-Cell Interaction: Characteristics, Direct and Non-Direct Effects
  - 3.2.5. Radiosensitivity
  - 3.2.6. Adaptive Response
- 3.3. Radiopharmaceuticals
  - 3.3.1. The Radiopharmaceutical
  - 3.3.2. Conventional Diagnostic Radiopharmaceuticals
  - 3.3.3. Radionuclide Generators
  - 3.3.4. Localization Mechanisms

## tech 22 | Structure and Content

	3.3.5.	Positron Emission Tomography Radiopharmaceuticals
	3.3.6.	Synthesis Scheme
	3.3.7.	Metabolic Pathway Substrates
	3.3.8.	Radiopharmaceuticals with Therapeutic Effect
		3.3.8.1. Characteristics that Must be Met
		3.3.8.2. Design and Approval
3.4.	Radiopharmacy	
	3.4.1.	Regulatory Framework
	3.4.2.	Operation
	3.4.3.	Quality Control
3.5.	Image Acquisition and Processing	
	3.5.1.	Planar Image
	3.5.2.	Components
	3.5.3.	Performance: Resolution and Sensitivity
	3.5.4.	Acquisition Modes: Static, Dynamic, Synchronized
	3.5.5.	Reconstruction
	3.5.6.	Single Photon Tomography (SPECT)
	3.5.7.	Acquisition
	3.5.8.	Reconstruction
	3.5.9.	Positron Emission Tomography (PET)
	3.5.10.	Components
	3.5.11.	Acquisition of Data
	3.5.12.	Operating Parameters
3.6.	Quantification Techniques: Basis	
	3.6.1.	In Cardiology
	3.6.2.	In Neurology
	3.6.3.	Metabolic Parameters
	3.6.4.	The Image of TC





## Structure and Content | 23 tech

- 3.7. Image Generation
  - 3.7.1. Acquisition and Reconstruction Parameters
  - 3.7.2. Protocols and Contrast Media
  - 3.7.3. Head and Neck
  - 3.7.4. Thorax: Cardiology, Lung
  - 3.7.5. Abdomen: General, Liver, Renal
- 3.8. The Image of RM
  - 3.8.1. Resonance Phenomenon
  - 3.8.2. Tissue Contrast: Sequence Knowledge
  - 3.8.3. Diffusion
  - 3.8.4. Paramagnetic Contrasts
- 3.9. The Multimodality Image
  - 3.9.1. SPECT/TC
  - 3.9.2. PET/TC
  - 3.9.3. PET/RM
- 3.10. Radioprotection
  - 3.10.1. The Radioprotection
  - 3.10.2. Special Situations: Pediatrics, Pregnancy and Lactation
  - 3.10.3. Regulatory Framework: Implementation
  - 3.10.4. Dosimetry



You will be one of the most respected physicians in the service when you complete this qualification"





## tech 26 | Methodology

#### At TECH we use the Case Method

What should a professional do in a given situation? Throughout the program, students will face multiple simulated clinical cases, based on real patients, in which they will have to do research, establish hypotheses, and ultimately resolve the situation. There is an abundance of scientific evidence on the effectiveness of the method. Specialists learn better, faster, and more sustainably over time.

With TECH you will experience a way of learning that is shaking the foundations of traditional universities around the world.



According to Dr. Gérvas, the clinical case is the annotated presentation of a patient, or group of patients, which becomes a "case", an example or model that illustrates some peculiar clinical component, either because of its teaching power or because of its uniqueness or rarity. It is essential that the case is based on current professional life, trying to recreate the real conditions in the physician's professional practice.



Did you know that this method was developed in 1912, at Harvard, for law students? The case method consisted of presenting students with real-life, complex situations for them to make decisions and justify their decisions on how to solve them. In 1924, Harvard adopted it as a standard teaching method"

#### The effectiveness of the method is justified by four fundamental achievements:

- Students who follow this method not only achieve the assimilation of concepts, but also a development of their mental capacity, through exercises that evaluate real situations and the application of knowledge.
- 2. Learning is solidly translated into practical skills that allow the student to better integrate into the real world.
- 3. Ideas and concepts are understood more efficiently, given that the example situations are based on real-life.
- 4. Students like to feel that the effort they put into their studies is worthwhile. This then translates into a greater interest in learning and more time dedicated to working on the course.





### **Relearning Methodology**

At TECH we enhance the Harvard case method with the best 100% online teaching methodology available: Relearning.

This university is the first in the world to combine the study of clinical cases with a 100% online learning system based on repetition, combining a minimum of 8 different elements in each lesson, a real revolution with respect to the mere study and analysis of cases.

Professionals will learn through real cases and by resolving complex situations in simulated learning environments. These simulations are developed using state-of-the-art software to facilitate immersive learning.



## Methodology | 29 tech

At the forefront of world teaching, the Relearning method has managed to improve the overall satisfaction levels of professionals who complete their studies, with respect to the quality indicators of the best online university (Columbia University).

With this methodology, more than 250.000 physicians have been trained with unprecedented success in all clinical specialties regardless of surgical load. Our pedagogical methodology is developed in a highly competitive environment, with a university student body with a strong socioeconomic profile and an average age of 43.5 years old.

Relearning will allow you to learn with less effort and better performance, involving you more in your specialization, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation to success.

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.

The overall score obtained by TECH's learning system is 8.01, according to the highest international standards.

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.



#### **Surgical Techniques and Procedures on Video**

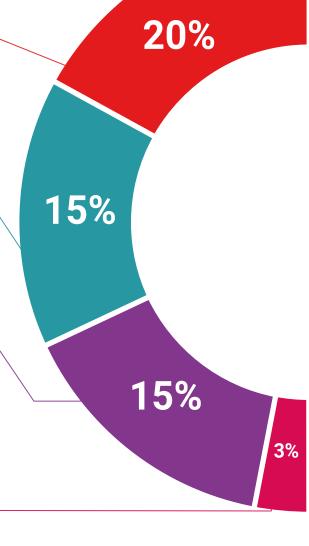
TECH introduces students to the latest techniques, the latest educational advances and to the forefront of current medical techniques. All of this in direct contact with students and explained in detail so as to aid their assimilation and understanding. And best of all, you can watch the videos as many times as you like.



#### **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.

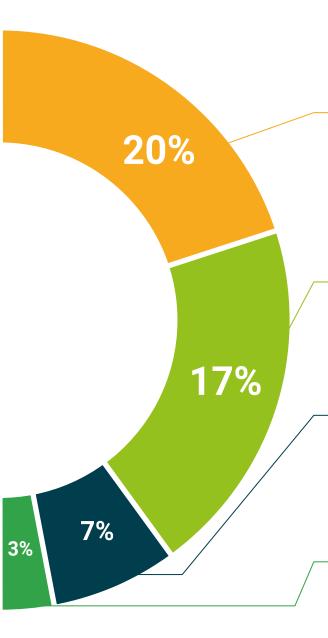
This exclusive multimedia content presentation training Exclusive system was awarded by Microsoft as a "European Success Story".





#### **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.



#### **Expert-Led Case Studies and Case Analysis**

Effective learning ought to be contextual. Therefore, TECH presents real cases in which the expert will guide students, focusing on and solving the different situations: a clear and direct way to achieve the highest degree of understanding.



#### **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 your goals.



#### Classes

There is scientific evidence on the usefulness of learning by observing experts: The system termed Learning from an Expert strengthens knowledge and recall capacity, and generates confidence in the face of difficult decisions in the future.



#### **Quick Action Guides**

TECH offers the most relevant contents of the course in the form of worksheets or quick action guides. A synthetic, practical, and effective way to help students progress in their learning.







## tech 34 | Certificate

This program will allow you to obtain your **Postgraduate Diploma in Nuclear Medicine in Pediatrics** 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 Diploma in Nuclear Medicine in Pediatrics

Modality: online

Duration: 6 months

Accreditation: 18 ECTS



Mr./Ms. \_\_\_\_\_, with identification document \_\_\_\_\_ has successfully passed and obtained the title of:

#### Postgraduate Diploma in Nuclear Medicine in Pediatrics

This is a program of 450 hours of duration equivalent to 18 ECTS, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH Global University is a university officially recognized by the Government of Andorra on the 31st of January of 2024, which belongs to the European Higher Education Area (EHEA).

In Andorra la Vella, on the 28th of February of 2024



<sup>\*</sup>Apostille Convention. In the event that the student wishes to have their paper diploma issued with an apostille, TECH Global University will make the necessary arrangements to obtain it, at an additional cost.

tech global university

# Postgraduate Diploma Nuclear Medicine in Pediatrics

- » Modality: online
- » Duration: 6 months
- » Certificate: TECH Global University
- » Credits: 18 ECTS
- » Schedule: at your own pace
- Exams: online

