

# Postgraduate Certificate

## Radiophysics in External Radiotherapy in Proton Therapy





## Postgraduate Certificate Radiophysics in External Radiotherapy in Proton Therapy

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

Website: [www.techtitute.com/us/nursing/postgraduate-certificate/radiophysics-external-radiotherapy-proton-therapy](http://www.techtitute.com/us/nursing/postgraduate-certificate/radiophysics-external-radiotherapy-proton-therapy)

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# 01

# Introduction

The World Health Organization predicts that cancer cases will affect more than 30 million people annually over the next decade. Hence, healthcare professionals must be prepared to deal effectively with these diseases. Nursing staff, for example, need to be up to date on disruptive techniques such as Proton Therapy and its significant therapeutic advantages. For this reason, TECH provides the study of a comprehensive program where these healthcare workers have the opportunity to acquire in-depth knowledge on strategies to reduce the side effects of this method by maximizing the deposition of radiation in the treatment areas. For this purpose, a convenient 100% online study modality is used, without tight schedules or continuous evaluations.





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*You will analyze the physical aspects of protons and their therapeutic impact thanks to this curriculum developed by TECH, the best digital university in the world according to Forbes”*

Despite its advantages, the Proton Therapy therapeutic process presents several uncertainties and challenges that require nurses' attention. An example of this is the anatomical variability of the internal organs with the passage of time, which is caused by aspects such as respiration, digestion or tissue mobility. In this way, these factors can lead to confusion in the precise administration of doses, especially in the case of tumors close to critical structures. In this sense, the nursing staff must be prepared to recognize these incidences, report them to the physicians and participate in their monitoring.

To support nurses in this task, TECH will provide a complete and updated Postgraduate Certificate that will delve into the most advanced aspects of proton beams. Designed by an experienced teaching staff, this academic itinerary will delve into the many advances that have been made in the field of Proton Therapy. Therefore, the syllabus will analyze its biological and physical effects and dosimetric implications. In this way, students will approach new technologies and innovative procedures in oncology, as well as the planning models and calculation algorithms that allow accurate dosage administration.

Moreover, the curriculum is complemented by multiple multimedia pills, specialized readings and case study simulations. This will allow students to engage in a fully dynamic learning process. The only thing students will need is a digital device with Internet access to access the Virtual Campus. The Virtual Campus will be available 24 hours a day. And all this without attendance or on-site classes with preset schedules, thus giving graduates the possibility to better manage their study time and reconcile their personal activities with a quality university program.

This **Postgraduate Certificate in Radiophysics in External Radiotherapy in Proton Therapy** contains the most complete and up-to-date scientific program on the market. The most important features include:

- ♦ The development of case studies presented by experts in Radiophysics
- ♦ 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



*You will delve into the nursing care required by a patient with adverse side effects of proton therapy such as fatigue”*

“

*You will learn about the functions of the BOLUS device to homogenize the radiation dose and preserve the most sensitive organs through this course”*

The program's teaching staff includes professionals from the field 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 during the academic year. For this purpose, the students will be assisted by an innovative interactive video system created by renowned and experienced experts.

*You will delve into the characteristics of state-of-the-art cancer equipment such as High Energy Linear Accelerators, for the production of neutrons and their activation in a safe way.*

*TECH's Relearning system will allow you to reduce the long hours of study, so frequent in other teaching methods. And forget about having to memorize!.*



# 02 Objectives

After this 6-week program, nurses will have a broad knowledge of proton beams and their clinical uses. In this way, they will be able to participate in the evaluation of the necessary requirements for the implementation of the most innovative techniques of proton therapy. In this sense, they will master the characteristics of the most sophisticated equipment in the radiotherapeutic field. They will also be prepared to implement measures aimed at radiological protection and thus guarantee the well-being of both patients and practitioners.







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*Update your nursing practice with the main innovations in image-guided treatment through this 100% online program”*



## General Objectives

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- ♦ Analyze the basic interactions of ionizing radiation with tissues
- ♦ Establish the effects and risks of ionizing radiation at the cellular level
- ♦ Analyze elements of photon and electron beam measurement in external radiotherapy
- ♦ Examine the quality control program
- ♦ Identify the different planning techniques for external radiotherapy treatments
- ♦ Analyze the interactions of protons with matter
- ♦ Examine radiation protection and radiobiology in Proton Therapy
- ♦ Analyze the technology and equipment used in intraoperative radiation therapy
- ♦ Examine the clinical outcomes of Brachytherapy in different oncological contexts
- ♦ Analyze the importance of the Radiological Protection
- ♦ Assimilate the existing risks derived from the use of ionizing radiation
- ♦ Develop the international regulations applicable to radiation protection





## Specific Objectives

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- Analyze proton beams and their clinical use
- Evaluate the necessary requirements for the characterization of this radiotherapy technique
- Establish the differences of this modality with conventional radiotherapy both technologically and clinically

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*Enroll now in a flexible university program, without fixed schedules and with content available 24 hours a day. Enroll now!”*

# 03

# Course Management

TECH's basic premise is to offer educational excellence. Therefore, this academic program has a teaching staff made up of leading specialists in the field of External Radiotherapy in Proton Therapy. These professionals, who are currently active in renowned hospitals, have a vast experience in the management of all types of cancer. For this purpose, they use surgical procedures and advanced techniques to guarantee the recovery of patients. Therefore, students are guaranteed to receive a first class update.



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*Experts with the best care results  
make up the teaching staff of this very  
complete academic itinerary”*

## 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, Universidad Católica San Antonio de 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 in the University of Valencia
- ◆ Reviewer of the journal Applied Radiation and Isotopes
- ◆ International PhD in Medical Physics, University of Seville
- ◆ Master's Degree in Medical Physics from the University of Rennes I
- ◆ Degree in Physics from the Universidad de Zaragoza
- ◆ Member of: European Federation of Organisations in Medical Physics (EFOMP), Spanish Society of Medical Physics (SEFM)

# 04

## Structure and Content

This Postgraduate Certificate will focus on the interaction of protons with matter, delving into its implications during measurement processes and quality controls. Designed by a group of specialist teachers in this field, the curriculum will provide guidelines for the use of the most advanced proton therapy equipment (among which the cyclotron stands out). In addition, the program will delve into the parameters of proton beams, as well as planning and calculation algorithms. The program will also promote the installation of elements that favor radiological protection for both patients and healthcare professionals.





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*You will gain comprehensive knowledge to further your career as a nurse in the specialized health services against cancer”*

## Module 1. Advanced Radiotherapy Method. Proton Therapy

- 1.1. Proton Therapy Radiotherapy with Protons
  - 1.1.1. Interaction of Protons with Matter
  - 1.1.2. Clinical Aspects of Proton Therapy
  - 1.1.3. Physical and Radiobiological Basis of Proton Therapy
- 1.2. Equipment in Proton Therapy
  - 1.2.1. Facilities
  - 1.2.2. Components in Proton Therapy Systems
  - 1.2.3. Physical and Radiobiological Basis of Proton Therapy
- 1.3. Proton Beam
  - 1.3.1. Parameters
  - 1.3.2. Clinical Implications
  - 1.3.3. Application in Oncological Treatments
- 1.4. Physical Dosimetry in Proton Therapy
  - 1.4.1. Absolute Dosimetry Measurements
  - 1.4.2. Beam Parameters
  - 1.4.3. Materials in Physical Dosimetry
- 1.5. Clinical Dosimetry in Proton Therapy
  - 1.5.1. Application of Clinical Dosimetry in Proton Therapy
  - 1.5.2. Planning and Calculation Algorithms
  - 1.5.3. Imaging Systems
- 1.6. Radiological Protection in Proton Therapy Procedures
  - 1.6.1. Design of an Installation
  - 1.6.2. Neutron Production and Activation
  - 1.6.3. Activation
- 1.7. Proton Therapy Treatments
  - 1.7.1. Image-Guided Treatment
  - 1.7.2. In Vivo Treatment Verification
  - 1.7.3. BOLUS Usage





- 1.8. Biological Effects of Proton Therapy
  - 1.8.1. Physical Aspects
  - 1.8.2. Radiobiology
  - 1.8.3. Dosimetric Implications
- 1.9. Measuring Equipment in Proton Therapy
  - 1.9.1. Dosimetric Equipment
  - 1.9.2. Radiation Protection Equipment
  - 1.9.3. Personal Dosimetry
- 1.10. Uncertainties in Proton Therapy
  - 1.10.1. Uncertainties Associated with Physical Concepts
  - 1.10.2. Uncertainties Associated with the Therapeutic Process
  - 1.10.3. Advances in Proton Therapy

“ You will have at your disposal a library full of multimedia resources in different formats such as explanatory videos or interactive summaries. Don't wait any longer and join this Postgraduate Certificate now”

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.



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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"*

## At TECH Nursing School we use the Case Method

In a given situation, what should a professional do? 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. Nurses learn better, faster, and more sustainably over time.

*With TECH, nurses can experience a learning methodology that is shaking the foundations of traditional universities around the world.*



According to Dr. Gervas, 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, in an attempt to recreate the real conditions in professional nursing practice.

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*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:

1. Nurses who follow this method not only grasp concepts, but also develop their mental capacity, by evaluating real situations and applying their knowledge.
2. The learning process has a clear focus on practical skills that allow the nursing professional to better integrate knowledge acquisition into the hospital setting or primary care.
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 case method with the best 100% online teaching methodology available: Relearning.

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



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



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 we have trained more than 175,000 nurses with unprecedented success in all specialities regardless of practical workload. 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 really 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.



### Nursing Techniques and Procedures on Video

We introduce you to the latest techniques, to the latest educational advances, 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 them as many times as you want.



### 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".



### 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 their goals.



#### 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.



#### 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.



06

# Certificate

The Postgraduate Certificate in Radiophysics in External Radiotherapy in Proton Therapy guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Global University.



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

This program will allow you to obtain your **Postgraduate Certificate in Radiophysics in External Radiotherapy in Proton Therapy** endorsed by **TECH Global University**, the world's largest online university.

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

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

Title: **Postgraduate Certificate in Radiophysics in External Radiotherapy in Proton Therapy**

Modality: **online**

Duration: **6 weeks**

Accreditation: **6 ECTS**



\*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.



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