

# Postgraduate Certificate

Radiophysics in External  
Radiotherapy in Clinical Dosimetry





## Postgraduate Certificate Radiophysics in External Radiotherapy in Clinical Dosimetry

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

Website: [www.techtitute.com/in/medicine/postgraduate-certificate/radiophysics-external-radiotherapy-clinical-dosimetry](http://www.techtitute.com/in/medicine/postgraduate-certificate/radiophysics-external-radiotherapy-clinical-dosimetry)

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# 01

# Introduction

Computer tools play a key role in the treatment of External Radiation Therapy patients. Instruments such as Modeling and Simulation Software allow physicians to reproduce treatment configurations, addressing factors such as radiation beam intensity. In this way, they apply optimal therapies aimed at slowing tumor progression and minimizing irradiation of healthy tissues. However, as technology advances, this field faces specific challenges that must be addressed to ensure the quality of procedures. For this reason, TECH implements this university program that analyzes in detail the clinical dosimetry and its healthcare impact. All this in a convenient 100% online mode for specialists to develop solid skills in an innovative way.





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*You will update your knowledge on the dose-volume histogram parameters to evaluate the response of users to treatments thanks to this university program"*

When patients undergo radiation therapy, they rely on the medical staff to apply the appropriate radiation doses to ensure their effectiveness. To do this, experts must first thoroughly investigate their medical histories and carry out extensive planning to find the most appropriate therapies. In this context, the total body irradiation (TBI) procedure is crucial for destroying the remaining cancer cells in the body and helps to make room in the patients' bone marrow, allowing new blood stem cells to grow. To avoid risks of toxicity and damage to normal tissues, specialists must delve into less aggressive alternatives.

In order to support them in this task, TECH has developed a complete program that will delve into Clinical Dosimetry and all stages of the radiotherapy process to ensure the effectiveness of treatments. Under the support of an experienced teaching staff, the syllabus will address both the factors involved in dose distribution and calculation algorithms. The curriculum will also analyze various intensity-modulated treatments aimed at achieving optimization. In addition, the teaching materials will emphasize the use of 3D radiotherapy so that patients experience fewer side effects in contrast to other less conformal techniques.

It should be noted that the methodology of this program reinforces its innovative character. TECH offers a 100% online learning environment, adapted to the needs of busy professionals seeking to advance their careers. In addition, it will employ the *Relearning* methodology, based on the repetition of key concepts to fix knowledge and facilitate learning. In this way, the combination of flexibility and a robust pedagogical approach makes it highly accessible. In addition, students will have access to a library full of multimedia resources in different audiovisual formats (such as interactive summaries and infographics).

This **Postgraduate Certificate in Radiophysics in External Radiotherapy in Clinical Dosimetry** contains the most complete and up-to-date scientific program on the market. Its most notable features are:

- ♦ 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 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



*Looking to delve deeper into modeling in radiotherapeutic planning systems? This program will provide you with the most effective mathematical models and algorithms for your simulations to be the most rigorous"*

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*You will get the most out of 3D radiotherapy treatments for more effective tumor control with this update offered by TECH”*

The program's teaching staff includes professionals from the sector who contribute their work experience to this 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 master the manual calculation in Monitor Units and ensure that patients receive the radiation dose accurately.*

*The Relearning system applied in this program will allow you to acquire skills with less effort and more performance, involving you more in your clinical practice.*



# 02 Objectives

This 6-week curriculum will provide physicians with all the keys to determine the different stages in the treatment of External Radiation Therapy. In this way, graduates will perform simulations that will allow them to apply treatments to patients in the electron linear accelerator. Likewise, they will carry out quality control procedures to verify the safety and performance of the therapies.







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*You will handle the most effective tools to evaluate external radiotherapy planning. And only 6 weeks thanks to this Postgraduate Certificate"*



## 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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- Specify the different characteristics of the different types of external radiotherapy treatments
- Analyze the different verification systems of external radiotherapy plans, as well as the metrics used



*TECH offers you the most complete program on the market so that you can expand your knowledge and become more efficient in your profession"*

# 03

# Course Management

In its philosophy of providing educational excellence, TECH has carefully selected a teaching staff for the delivery of this Postgraduate Certificate. These professionals have years of research and professional experience behind them, which has allowed them to be part of prestigious hospitals. Therefore, students have the guarantees they need both to expand their knowledge and to obtain new skills that will allow them to make a quality leap in their careers.





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*You will have the support of a teaching staff with extensive research and professional experience”*

## 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
- ♦ Ph.D. 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. Morera Cano, Daniel

- ♦ Specialist in Hospital Radiophysics
- ♦ Hospital Radiophysics Faculty at the University Hospital Son Espases
- ♦ Master's Degree in Industrial Safety and Environment by the Polytechnic University of Valencia
- ♦ Master's Degree in Radiological Protection in Radioactive and Nuclear Facilities
- ♦ Degree in Industrial Engineering from the Polytechnic University of Valencia



# 04

## Structure and Content

This academic itinerary will delve into the treatment planning stage, ranging from simulation to procedures in linear electron accelerators. In this line, the syllabus will address different therapy verification systems such as beam calibration. In this way, graduates will ensure the correct delivery of the desired doses to patients and will develop specific quality controls for the verification of these processes.







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*This Postgraduate Certificate includes real case studies and exercises to bring the development of the program closer to your daily clinical practice"*

## Module 1. External Radiotherapy. Clinical Dosimetry

- 1.1. Clinical Dosimetry in External Radiotherapy
  - 1.1.1. Clinical Dosimetry in External Radiotherapy
  - 1.1.2. Treatment in External Radiotherapy
  - 1.1.3. Beam Modifying Elements
- 1.2. Stages of Clinical Dosimetry of External Radiotherapy
  - 1.2.1. Simulation Stage
  - 1.2.2. Treatment Planning.
  - 1.2.3. Treatment Verification
  - 1.2.4. Linear Electron Accelerator Treatment
- 1.3. Treatment Planning Systems in External Radiotherapy
  - 1.3.1. Models in Planning Systems
  - 1.3.2. Calculating Algorithms
  - 1.3.3. Utilities of Planning Systems
  - 1.3.4. Imaging Tools for Planning Systems
- 1.4. Quality Control of Planning Systems in External Radiotherapy
  - 1.4.1. Quality Control of Planning Systems in External Radiotherapy
  - 1.4.2. Initial Reference State
  - 1.4.3. Periodic Controls
- 1.5. Manual Calculation of Monitor Units (MUs)
  - 1.5.1. Manual Control of MUs
  - 1.5.2. Intervening Factors in Dose Distribution
  - 1.5.3. Practical Example of Calculation of MUs
- 1.6. Conformal 3D Radiotherapy Treatments
  - 1.6.1. 3D Radiotherapy (RT3D)
  - 1.6.2. Photon Beam RT3D Treatments
  - 1.6.3. Electron Beam RT3D Treatments
- 1.7. Advanced Intensity Modulated Treatments
  - 1.7.1. Modulated Intensity Treatments
  - 1.7.2. Optimization
  - 1.7.3. Specific Quality Control



- 1.8. Evaluation of External Radiation Therapy Planning
  - 1.8.1. Dose-volume Histogram
  - 1.8.2. Conformation Index and Homogeneity Index
  - 1.8.3. Clinical Impact of the Planning
  - 1.8.4. Planning Errors
- 1.9. Advanced Special Techniques in External Radiotherapy
  - 1.9.1. Radiosurgery and Extracranial Stereotactic Radiotherapy
  - 1.9.2. Total Body Irradiation
  - 1.9.3. Total Body Surface Irradiation
  - 1.9.4. Other Technologies in External Radiotherapy
- 1.10. Verification of Treatment Plans in External Radiotherapy
  - 1.10.1. Verification of Treatment Plans in External Radiotherapy
  - 1.10.2. Treatment Verification Systems
  - 1.10.3. Treatment Verification Metrics



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



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 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.

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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. 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 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.*





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 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 on the usefulness of learning by observing experts. The system known as 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 Clinical Dosimetry guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Technological University.



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

This **Postgraduate Certificate in Radiophysics in External Radiotherapy in Clinical Dosimetry** 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 Radiophysics in External Radiotherapy in Clinical Dosimetry**

Official Nº of Hours: **150 h.**



\*Apostille Convention. In the event that the student wishes to have their paper certificate issued with an apostille, TECH EDUCATION will make the necessary arrangements to obtain it, at an additional cost.

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education information tutors  
guarantee accreditation teaching  
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community commitment  
personalized service innovation  
knowledge present  
development languages  
virtual classroom

**tech** technological  
university

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