# Postgraduate Certificate

## Radiophysics in Radiobiology

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# Postgraduate Certificate

## Radiophysics in Radiobiology

- 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-radiobiology**

# Index

01

# Introduction

Brain tumors are often related to genetic mutations For this reason, radiotherapeutic procedures for this condition focus on reducing their size prior to surgery. To obtain favorable results in these interventions, all healthcare personnel must be properly taught and knowledgeable about the effects of ionizing radiation on DNA. Nurses, for example, need to be aware of their role in interventional therapies to contribute to patient survival. To facilitate the updating of skills of these professionals, TECH has developed a comprehensive program that delves into the most innovative techniques for the approach from Radiobiology of different cancer pathologies. In addition, it is taught in a convenient 100% online mode.

*Delve into hospital techniques for the management of irradiation syndromes with TECH, the best digital university in the world according to Forbes"*

In the specialty of Nuclear Medicine, specialists constantly use radiopharmaceuticals to obtain medical images and treat certain conditions. However, it is important that these exposures are carried out under strict control to ensure the safety of both patients and medical staff.
In this context, nurses must be actively involved and highly specialized in the estimation of the risk of exposure to ionizing radiation. In this way, they will be able to determine the risks associated with their use and apply the most appropriate radiological protection measures and collaborate with the rest of the health professionals in their containment.

Aware of the importance of this, TECH has implemented an innovative program that will provide nurses with an academic and systematic approach to radiation. Designed by a teaching group of excellence, the syllabus will address the dose limits stipulated by the International Commission on Radiological Protection. In this line, the syllabus will delve into the role of Radiobiology in different Radiotherapy procedures. In this way, graduates will attain a broad knowledge of the effects of phenomena such as proliferation and dose-response interaction. On the other hand, the didactic contents will offer the most advanced epidemiological studies on cell survival.

On the other hand, TECH will provide its students with a 100% online Virtual Campus, adapted to the needs of working professionals who want to advance in 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. All of this will be accessible remotely, from any portable device, or can be downloaded for offline consultation. Also, graduates will have at their fingertips a variety of multimedia resources, including explanatory videos, interactive summaries, among others.

This **Postgraduate Certificate in Radiophysics in Radiobiology** 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 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 get a comprehensive view of the interaction of radiation with organ tissues through this exhaustive course"*

*Become a specialized nurse to work in Nuclear Medicine services with this 6-week program"*

*You will update your knowledge of the parameters that affect the biological response of patients to radiation.*

*Thanks to the Relearning system used by TECH you will reduce the long hours of study and memorization.*

The program's teaching staff includes professionals from the industry 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.

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# Objectives

Upon completion of this study, students will have a broad understanding of the interactions of ionizing radiation with tissues. In this way, they will be able to identify the effects and risks of irradiation at the cellular level. At the same time, the nurses will delve into the different effective mathematical models in radiobiological matters. They will also carry out useful simulations to deal with the distribution of radiation in the organs during radiotherapy treatments.

*You will acquire a holistic view of the main advances related to Radiobiology and the implications they have for your practice as a nurse"*

## General Objectives

- 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

- Assess the risks associated with the main medical exposures
- Analyze the effects of the interaction of ionizing radiation with tissues and organs
- Examine the different existing mathematical models in radiobiology

*You will address in detail the factors that alter radiosensitivity to provide patients with the most personalized care"*

03

# Course Management

This Postgraduate Certificate is designed following the guidelines of a group of experts. The teachers who are part of this program have extensive professional experience, having worked in prestigious institutions in the health sector. These professionals will provide students with diverse didactic materials, with which graduates will delve into the interaction of ionizing radiation with biological tissues.

*You will have access to a curriculum designed by a reputable teaching staff that accumulates the most up-to-date 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
- 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), and Spanish Society of Medical Physics (SEFM)

*Take the opportunity to learn about the latest advances in this field in order to apply it to your daily practice"*

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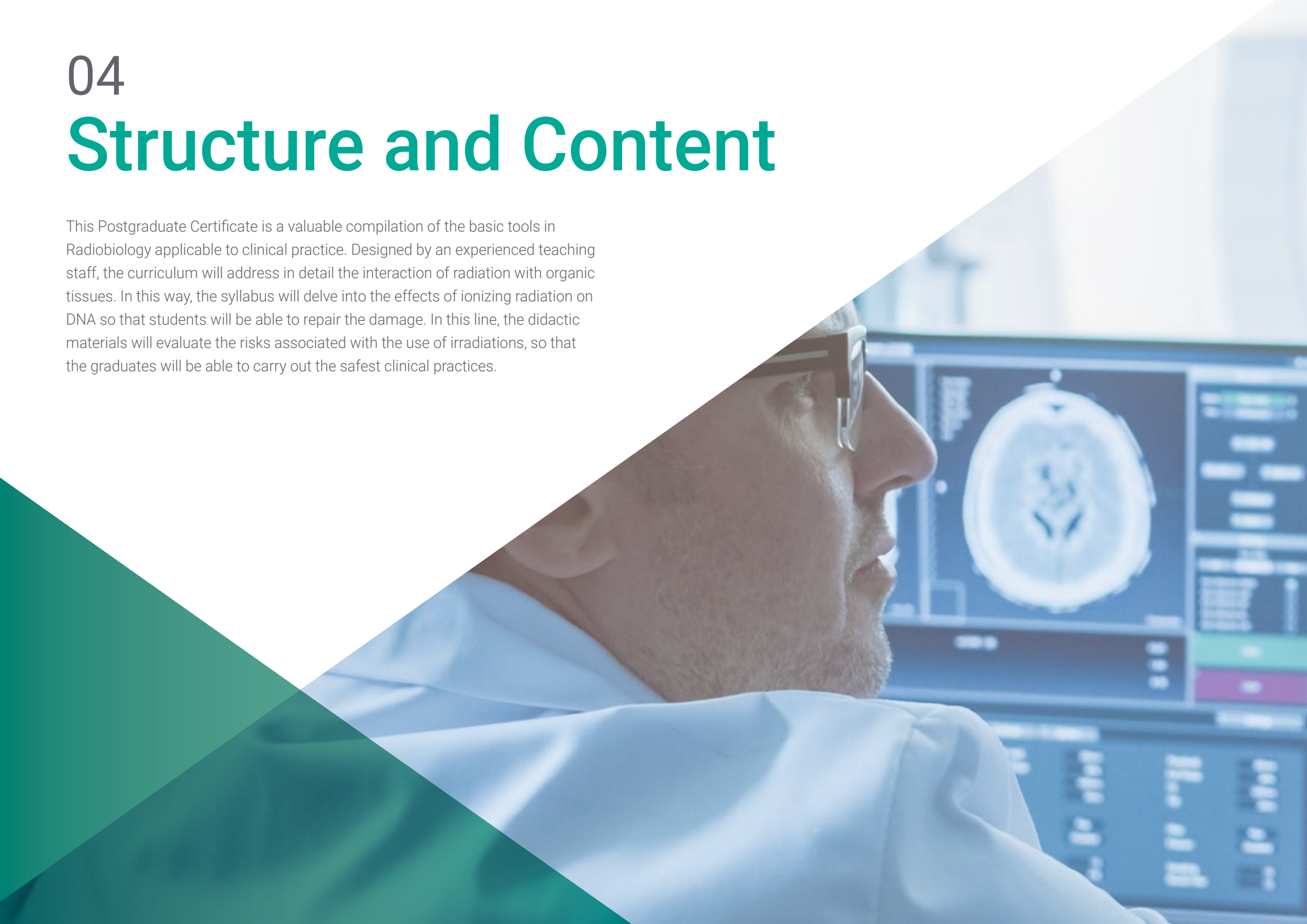
# Structure and Content

This Postgraduate Certificate is a valuable compilation of the basic tools in Radiobiology applicable to clinical practice. Designed by an experienced teaching staff, the curriculum will address in detail the interaction of radiation with organic tissues. In this way, the syllabus will delve into the effects of ionizing radiation on DNA so that students will be able to repair the damage. In this line, the didactic materials will evaluate the risks associated with the use of irradiations, so that the graduates will be able to carry out the safest clinical practices.



*You will be able to assess the risks associated with the main medical exposures and ensure safe clinical practices"*

## **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 Cells
- 1.1.3. Physical-Chemical 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

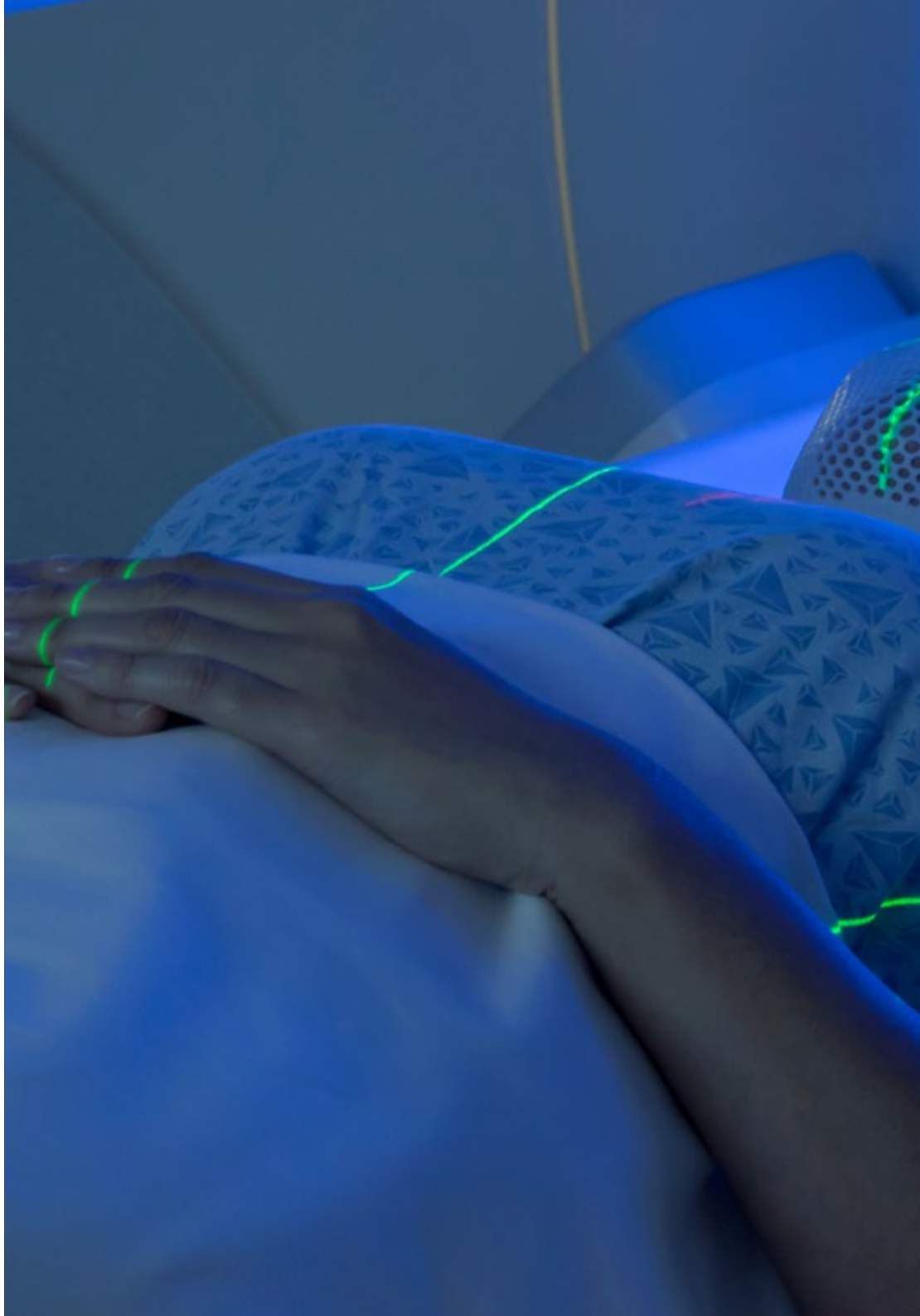
1.3. Effects of Radiation on Organic Tissues
- 1.3.1. Effects on the Cell Cycle
- 1.3.2. Irradiation Syndromes
- 1.3.3. Aberrations and Mutations

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 Radiations 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

*You will acquire knowledge without geographical limitations or pre-established timing. Join TECH now!"*

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# Methodology

This program offers students a different way of learning. Our methodology uses a cyclical learning approach: **Relearning**.

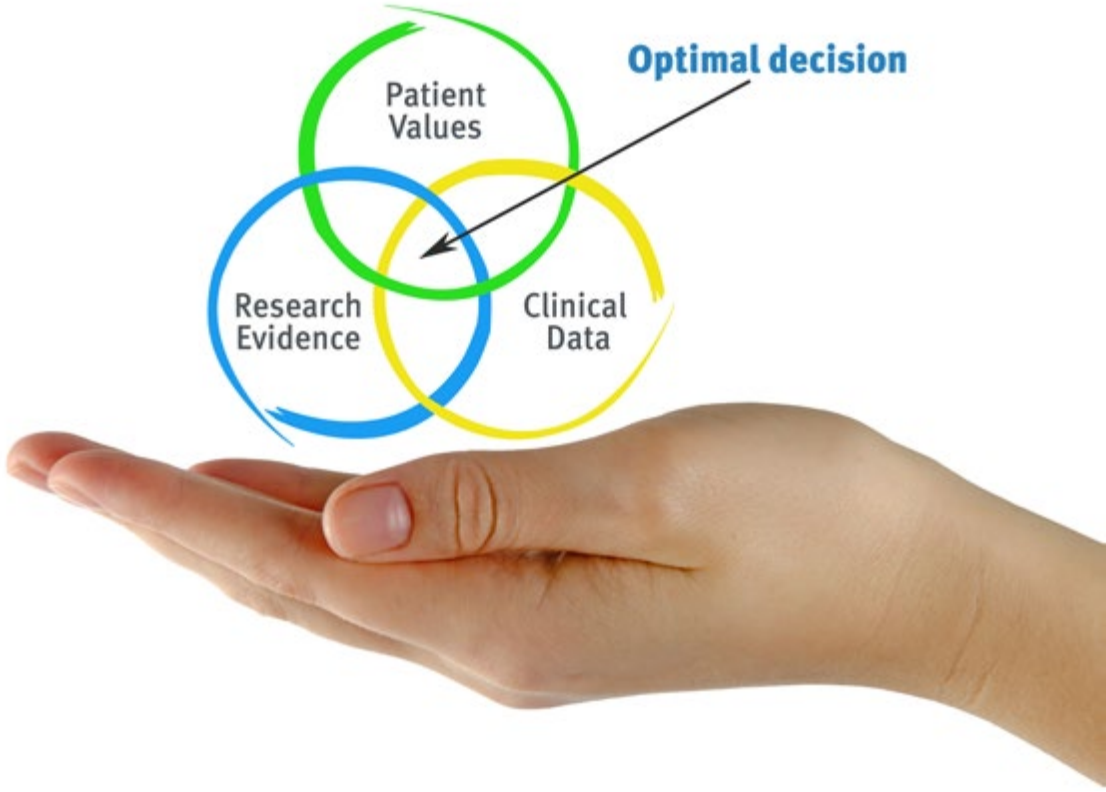
This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.

*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"*

## 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. 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, in an attempt to recreate the real conditions in professional nursing 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:**

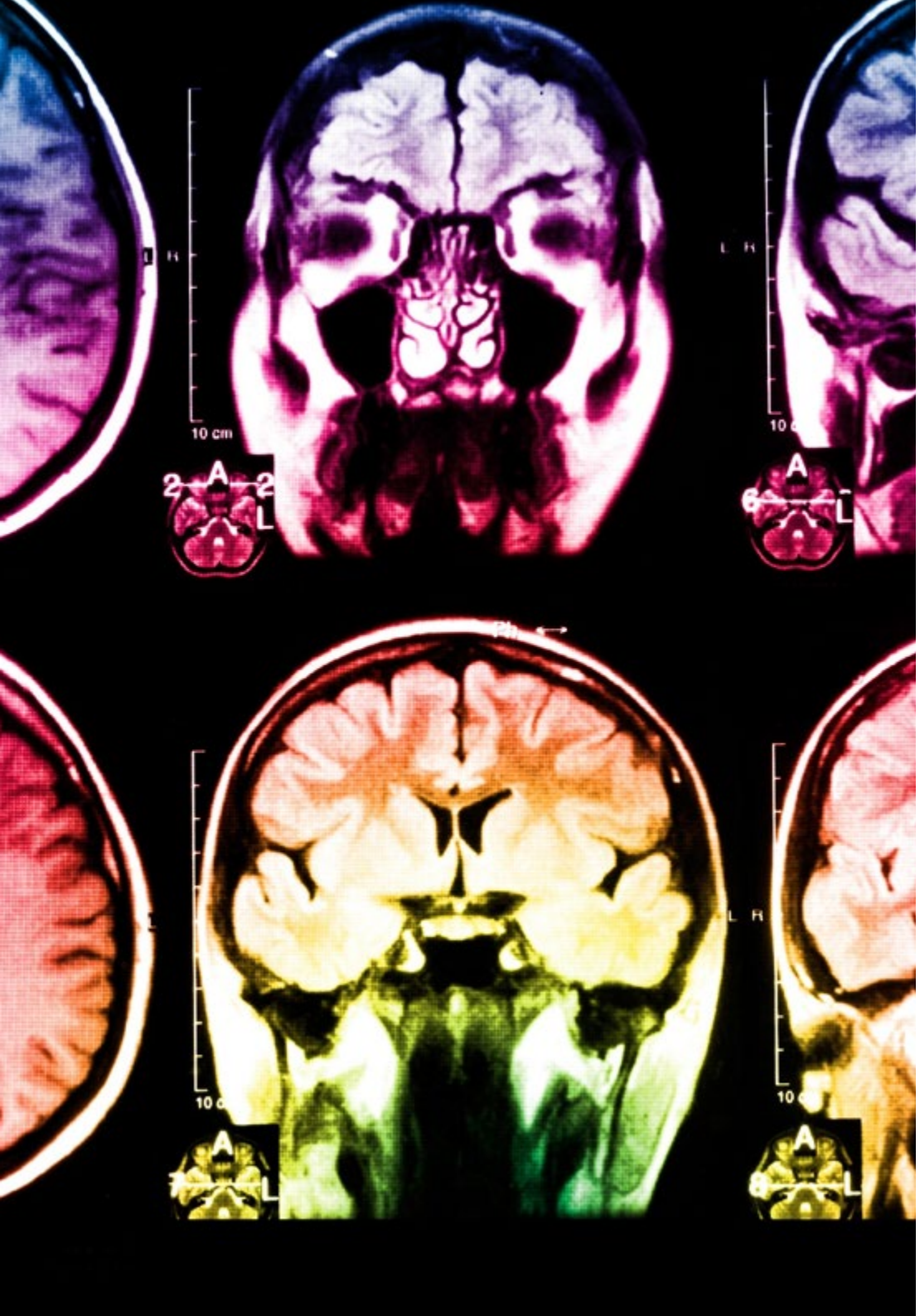
1. Nurses who follow this method not only grasp concepts, but also develop their mental capacity, by evaluating real situations and applying their knowledge.
2. The learning process has a clear focus on practical skills that allow the nursing professional to better integrate knowledge acquisition into 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

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.

*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 prepared more than 175,000 nurses with unprecedented success in all specialities regardless of practical workload. Our educational 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 adapted in 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.

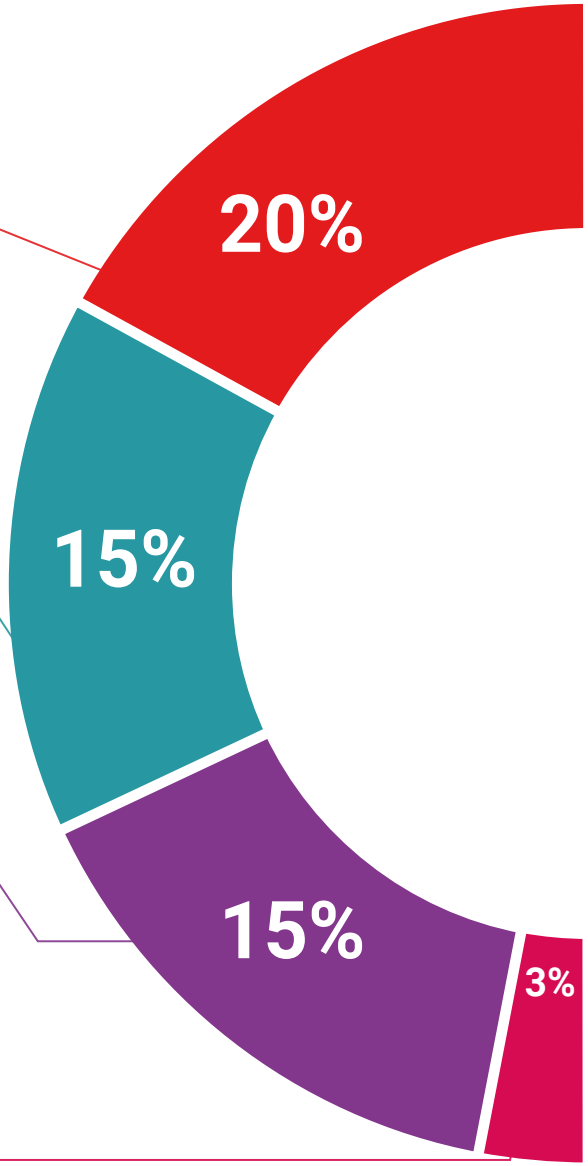
### Interactive Summaries

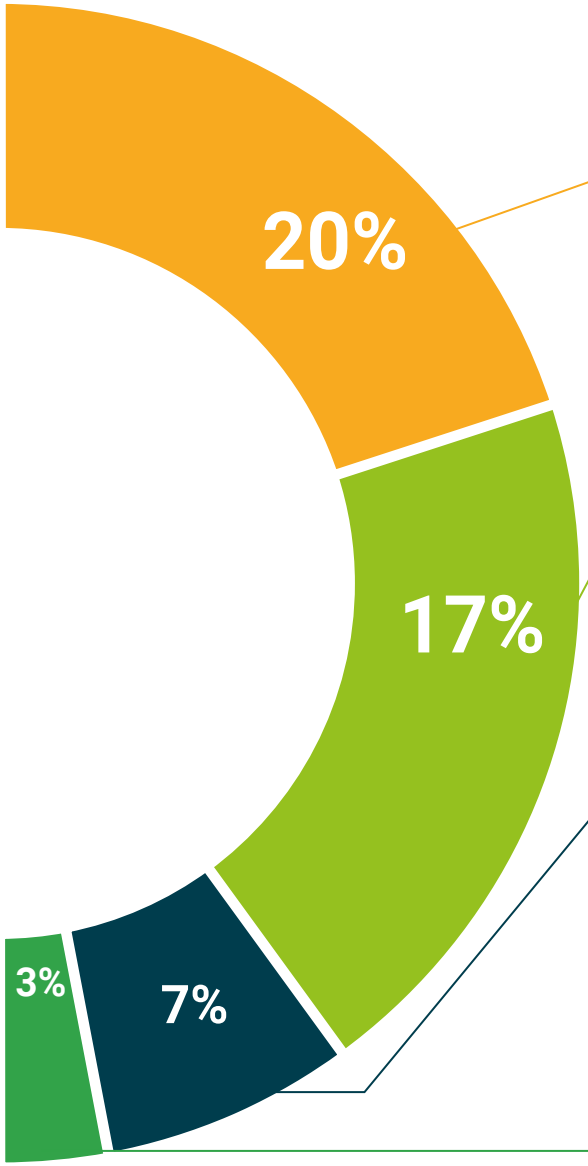
The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

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

The student's knowledge is periodically assessed and re-assessed throughout the program, through evaluative and self-evaluative activities and exercises: in this way, students can check how they are doing in terms of 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.

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# Certificate

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

*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 Radiobiology** 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.

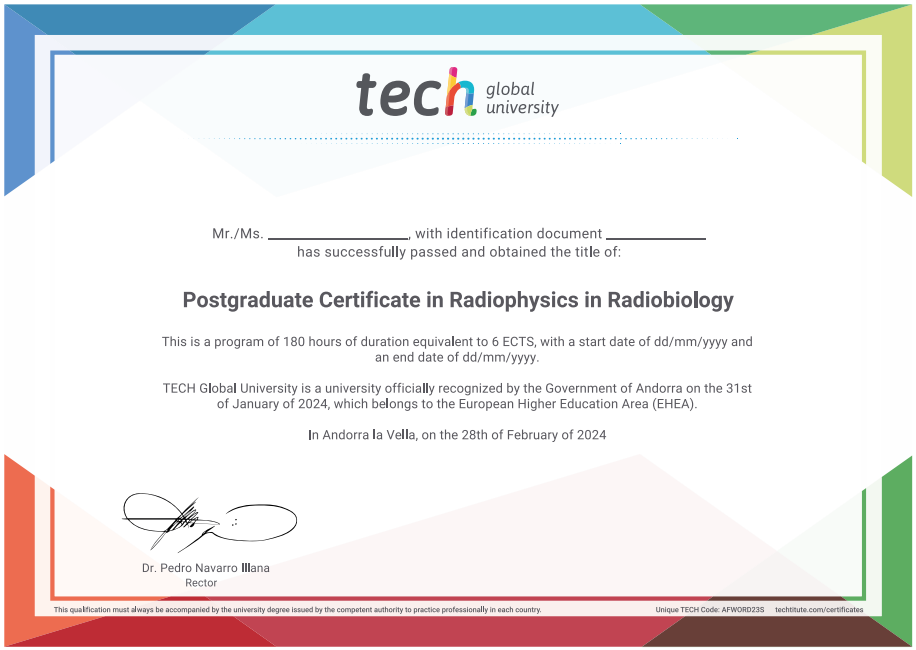
This **TECH Global University** title is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Postgraduate Certificate in Radiophysics in Radiobiology**

Modality: **online**

Duration: **6 weeks**

Accreditation: **6 ECTS**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Mr./Ms. _____, with identification document _____
has successfully passed and obtained the title of:

**Postgraduate Certificate in Radiophysics in Radiobiology**

This is a program of 180 hours of duration equivalent to 6 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

Dr. Pedro Navarro Illana
Rector

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 diploma issued with an apostille, TECH Global University will make the necessary arrangements to obtain it, at an additional cost.

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