Postgraduate Diploma

Radiophysics Applied to Radiotherapy

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Postgraduate Diploma
Radiophysics Applied to Radiotherapy

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

Website: **www.techtitute.com/us/nursing/postgraduate-diploma/postgraduate-diploma-radiophysics-applied-radiotherapy**

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01

Introduction

The application of Radiophysics in Radiotherapy is an essential pillar in the fight against cancer. Its highly precise and personalized approach enables accurate delivery of therapeutic doses of radiation, improving the effectiveness of treatment by directly targeting the affected tissue. This approach also places emphasis on preserving healthy surrounding tissues, reducing unwanted side effects. In this context, TECH is committed to providing nurses with a comprehensive program that trains them in the use of radiation to improve both the diagnosis and treatment of various diseases. Thanks to the innovative *Relearning* methodology and the 100% online modality, graduates will have the flexibility to adapt to their own schedules.

You will delve into simulation systems and will be able to evaluate the side effects of each therapy"

Radiophysics Applied to Radiotherapy is an essential discipline in the field of Oncology Nursing. For example, it serves to collaborate in the identification and prevention of possible problems in the administration of radiotherapy. In tune with this, these experts are often in charge of explaining to patients the possible side effects of the therapies, as well as the precautions they should take. For this reason, it is important for nurses to gain in-depth knowledge about ionizing radiation and its effect on tissues.

In order to support them in this task, TECH has developed an advanced program that will train specialists in the use of radiation to optimize the diagnosis and treatment of multiple conditions. With the supervision of a well-versed teaching team, the curriculum will analyze the interaction between ionizing radiation and biological tissues, unraveling the resulting cellular and biological effects. It will also address the intricate repair mechanisms and evaluate the biological efficiency of different ionizing radiation.

Likewise, the clinical practice of External Radiation Therapy will be delved into, highlighting the importance of radioprotection and associated risk management, delving into physical and clinical dosimetry. Regarding the latter, special emphasis will be placed on the use of computer tools for problem solving. Finally, each stage of the radiotherapy process will be examined, from simulation to treatment with linear electron accelerators.

It should be noted that the approach of this program reinforces its innovative character. Along these lines, TECH offers a 100% online educational environment, tailored to the needs of busy professionals seeking to advance their careers. Through the *Relearning*, methodology, based on the repetition of key concepts to fix knowledge and facilitate learning, flexibility is combined with a robust pedagogical approach. In addition, graduates will have access to an extensive library of innovative multimedia resources.

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

- The development of practical cases presented by experts in Radiophysics applied to Radiotherapy
- 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

Do you want to implement the most advanced quality assurance programs in Physical Dosimetry? Achieve it with this program in only 150 hours"

You will obtain specialized knowledge for clinical practice in the various areas where ionizing radiation is present"

You will perform manual calculations of Monitor Units and ensure the accuracy of treatments.

You will achieve your objectives thanks to TECH's didactic tools, including explanatory videos and interactive summaries.

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.

02

Objectives

This Postgraduate Diploma will provide the nurse with the keys to understand the basic interactions of ionizing radiation with tissues, recognizing their risks at the cellular level. In this sense, upon completion of the program, graduates will be able to develop procedures for the calibration of photon and electron beams, which will allow them to effectively apply the elements required for External Radiation Therapy treatments. In addition, they will implement procedures aimed at quality control of planning systems and evaluate the response of patients to therapies.

TECH's main objective is to help its students achieve academic and professional excellence"

General Objectives

- Investigate the the basic interactions of ionizing radiation with tissues
- Establish the effects and risks of ionizing radiation at the cellular level
- Determine the cellular response these effects to various medical exposures
- Specify the equipment used in external radiotherapy treatments
- Develop the steps to initiate treatments with external radiotherapy equipment
- Analyze the elements used in photon and electron beam measurement for the treatment of external radiotherapy
- Examine the quality control program
- Analyze the evolution of clinical dosimetry in external radiotherapy over the years
- Delve into the different stages of external radiotherapy treatment
- Delve into the characteristics of treatment planning systems
- Identify the different planning techniques for external radiotherapy treatments
- Apply specific quality controls for the verification of treatment plans

You will master the Linear Electron Accelerator to verify that the radiation dose is adequate and that safety protocols are met"

Specific Objectives

Module 1. Radiobiology

- 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
- Establish the different parameters that affect the biological response to ionizing radiation

Module 2. External Radiotherapy. Physical Dosimetry

- Set up simulation, localization and image-guided radiotherapy Different equipment
- Develop photon beam and electron beam calibration procedures
- Examine the quality control program of radiotherapy equipment

Module 3. External Radiotherapy. Clinical Dosimetry

- Specify the different characteristics of the types of external radiotherapy treatments
- Develop quality control procedures for the planning systems
- Examine the tools that allow external radiotherapy planning evaluation
- Analyze the different verification systems of external radiotherapy plans, as well as the metrics used

03

Course Management

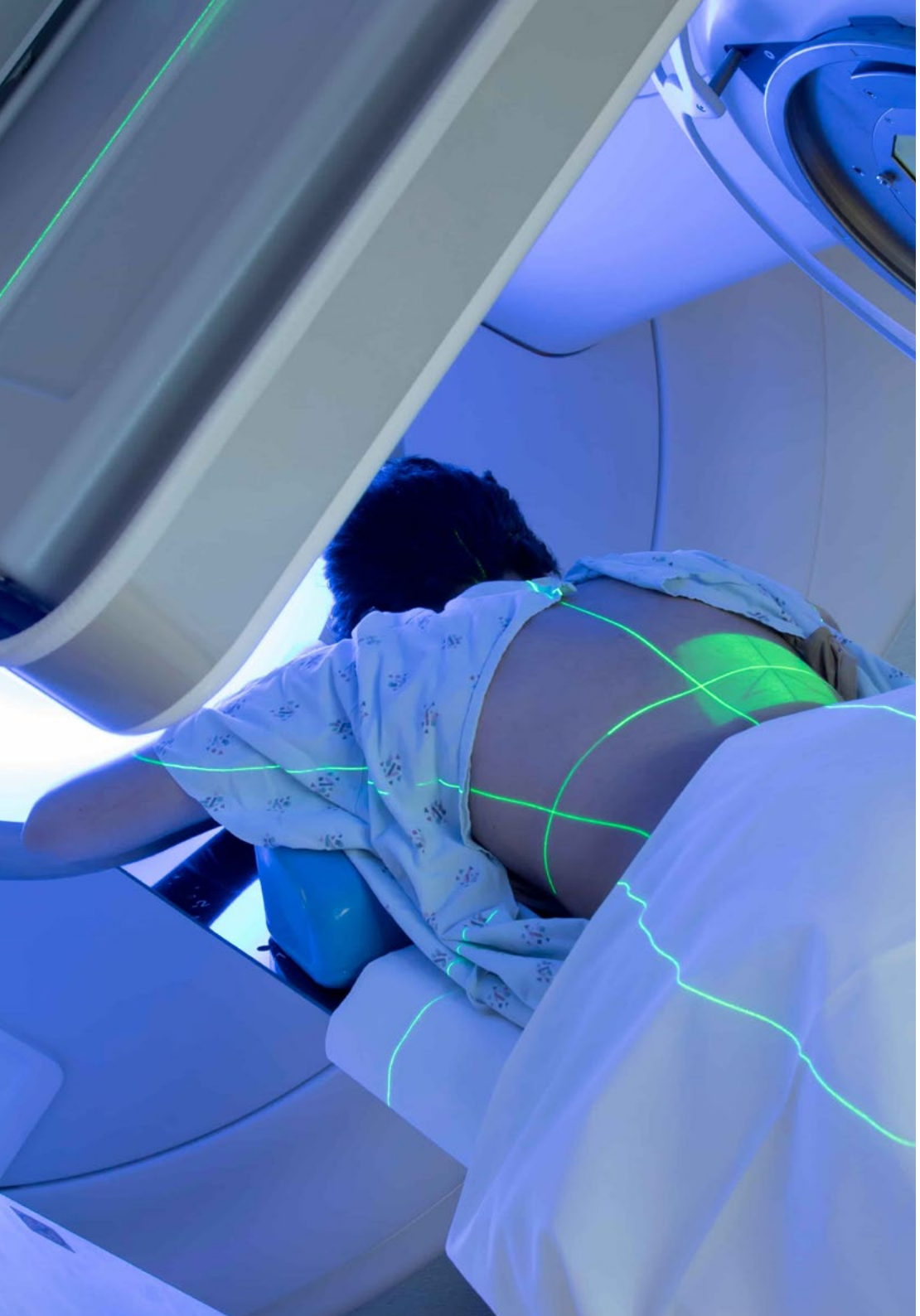
Thanks to TECH's untiring commitment to raise the educational level of all its degrees, this program is characterized by having a teaching team made up of specialists in Radiophysics Applied to Radiotherapy. It should be noted that these experts have developed their professional activities in hospitals of national prestige, which will ensure that the didactic contents are fully updated and valid in the health sector.

A specialized teaching team will transmit their extensive knowledge in the field of Radiophysics Applied to Radiotherapy through this advanced training"

Management

Dr. De 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)

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 curriculum is a helpful guide to the safety and care of patients receiving radiation therapy. Designed by a well-versed faculty, the curriculum will delve into concepts related to the interaction of radiation with organ tissues. The didactic materials will also enable nurses to use modern technological tools of physical dosimetry, including computed tomography, to obtain cross-sectional images of anatomical structures. In addition, training will emphasize the importance of accurate treatment planning, offering techniques to verify outcomes using verification metrics.

You will demonstrate your commitment to Medical Oncology and drive crucial advances in the fight against Cancer"

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

Module 2. External Radiotherapy. Physical Dosimetry

2.1. Linear Electron Accelerator. Equipment in External Radiotherapy
- 2.1.1. Linear Electron Accelerator (LEA)
- 2.1.2. External Radiotherapy Treatment Planner (TPS)
- 2.1.3. Record Keeping and Verification System
- 2.1.4. Special Techniques
- 2.1.5. Hadrontherapy

2.2. Simulation and Localization Equipment in External Radiation Therapy
- 2.2.1. Conventional Simulator
- 2.2.2. Computed Tomography (CT) Simulation
- 2.2.3. Other Image Modalities

2.3. Image-guided External Radiation Therapy Equipment
- 2.3.1. Simulation equipment
- 2.3.2. Image-guided Radiotherapy Equipment. CBCT
- 2.3.3. Image-guided Radiotherapy Equipment. Planar Image
- 2.3.4. Auxiliary Localization Systems

2.4. Photon Beams in Physical Dosimetry
- 2.4.1. Measuring Equipment
- 2.4.2. Calibration Protocols
- 2.4.3. Calibration of Photon Beams
- 2.4.4. Relative Dosimetry of Photon Beams

2.5. Electron Beams in Physical Dosimetry
- 2.5.1. Measuring Equipment
- 2.5.2. Calibration Protocols
- 2.5.3. Calibration of Electron Beams
- 2.5.4. Relative Dosimetry of Electron Beams

2.6. Implementation of External Radiotherapy Equipment
- 2.6.1. Installation of External Radiotherapy Equipment
- 2.6.2. Acceptance of External Radiotherapy Equipment
- 2.6.3. Initial Reference Status (IRS)
- 2.6.4. Clinical Use of External Radiotherapy Equipment
- 2.6.5. Treatment Planning Systems

2.7. Quality Control of External Radiotherapy Equipment
- 2.7.1. Quality Control of Linear Accelerators
- 2.7.2. Quality Control in the IGRT Equipment
- 2.7.3. Quality Control in Simulation Systems
- 2.7.4. Special Techniques

2.8. Quality Control of Radiation Measuring Equipment
- 2.8.1. Dosimetry
- 2.8.2. Measuring Tools
- 2.8.3. Mannequins Employed

2.9. Application of Risk Analysis Systems in External Radiation Therapy
- 2.9.1. Risk Analysis Systems
- 2.9.2. Error Reporting Systems
- 2.9.3. Process Mapping

2.10. Quality Assurance Programming in Physical Dosimetry
- 2.10.1. Responsibilities
- 2.10.2. Requirements in External Radiotherapy
- 2.10.3. Quality Assurance Programming Clinical and Physical Aspects
- 2.10.4. Maintenance of Quality Control Program

Module 3. External Radiotherapy. Clinical Dosimetry

3.1. Clinical Dosimetry in External Radiotherapy
- 3.1.1. Clinical Dosimetry in External Radiotherapy
- 3.1.2. Treatment in External Radiotherapy
- 3.1.3. Beam Modifying Elements

3.2. Stages of Clinical Dosimetry of External Radiotherapy
- 3.2.1. Simulation Stage
- 3.2.2. Treatment Planning
- 3.2.3. Treatment Verification
- 3.2.4. Linear Electron Accelerator Treatment

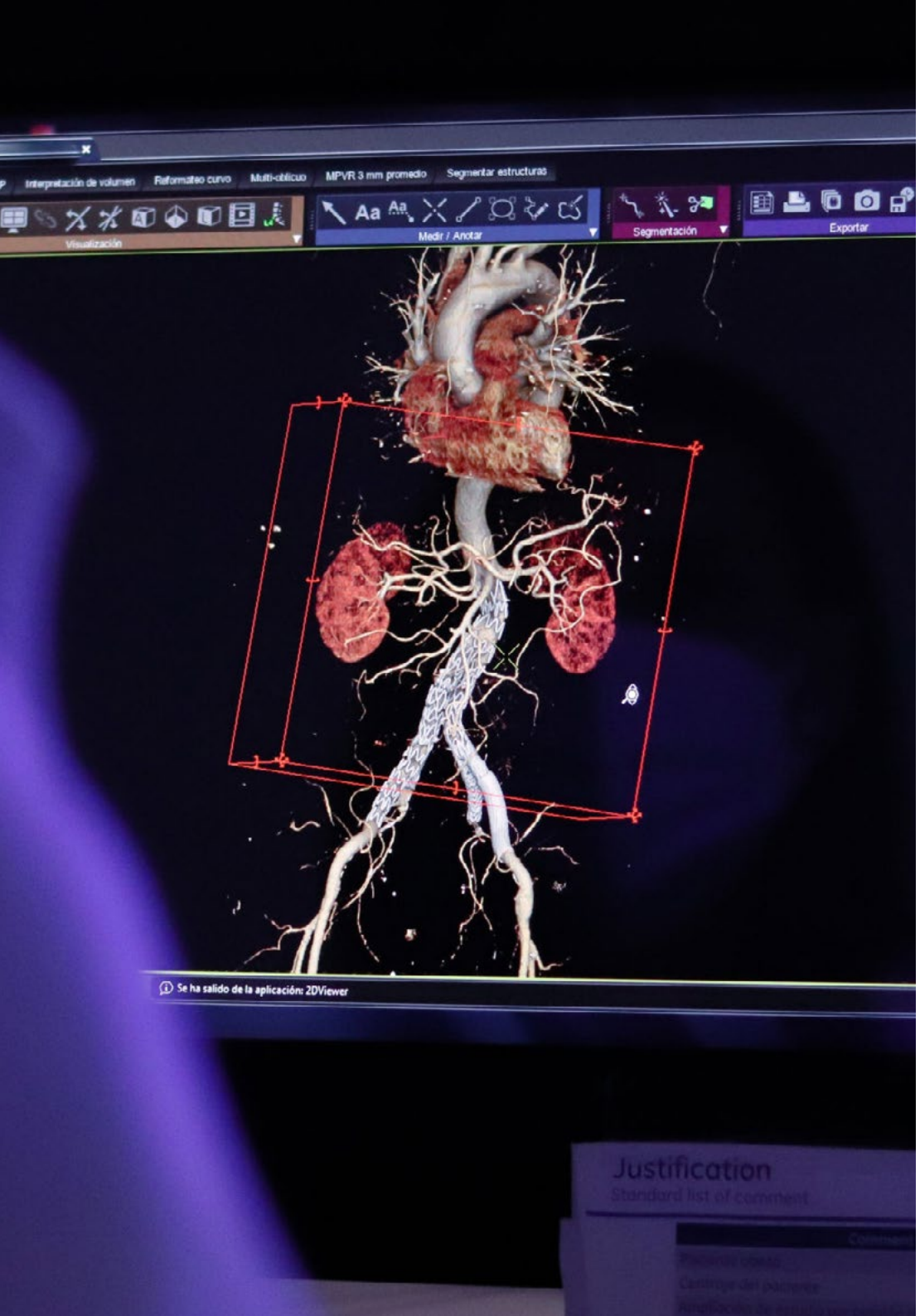
3.3. Treatment Planning Systems in External Radiotherapy
- 3.3.1. Models in Planning Systems
- 3.3.2. Calculating Algorithms
- 3.3.3. Utilities of Planning Systems
- 3.3.4. Imaging Tools for Planning Systems

3.4. Quality Control of Planning Systems in External Radiotherapy
- 3.4.1. Quality Control of Planning Systems in External Radiotherapy
- 3.4.2. Initial Reference State
- 3.4.3. Periodic Controls

3.5. Manual Calculation of Monitor Units (MUs)
- 3.5.1. Manual Control of MUs
- 3.5.2. Intervening Factors in Dose Distribution
- 3.5.3. Practical Example of Calculation of UMs

3.6. Conformal 3D Radiotherapy Treatments
- 3.6.1. 3D Radiotherapy (RT3D)
- 3.6.2. Photon Beam RT3D Treatments
- 3.6.3. Electron Beam RT3D Treatments

3.7. Advanced Intensity Modulated Treatments
- 3.7.1. Modulated Intensity Treatments
- 3.7.2. Optimization
- 3.7.3. Specific Quality Control



3.8. Evaluation of External Radiation Therapy Planning
- 3.8.1. Dose-volume Histogram
- 3.8.2. Conformation Index and Homogeneity Index
- 3.8.3. Clinical Impact of the Planning
- 3.8.4. Planning Errors

3.9 Advanced Special Techniques in External Radiotherapy
- 3.9.1. Radiosurgery and Extracranial Stereotactic Radiotherapy
- 3.9.2. Total Body Irradiation
- 3.9.3. Total Body Surface Irradiation
- 3.9.4. Other Technologies in External Radiotherapy

3.10. Verification of Treatment Plans in External Radiotherapy
- 3.10.1. Verification of Treatment Plans in External Radiotherapy
- 3.10.2. Treatment Verification Systems
- 3.10.3. Treatment Verification Metrics

Acquire knowledge without geographic limitations or pre-established timing"

05

Methodology

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

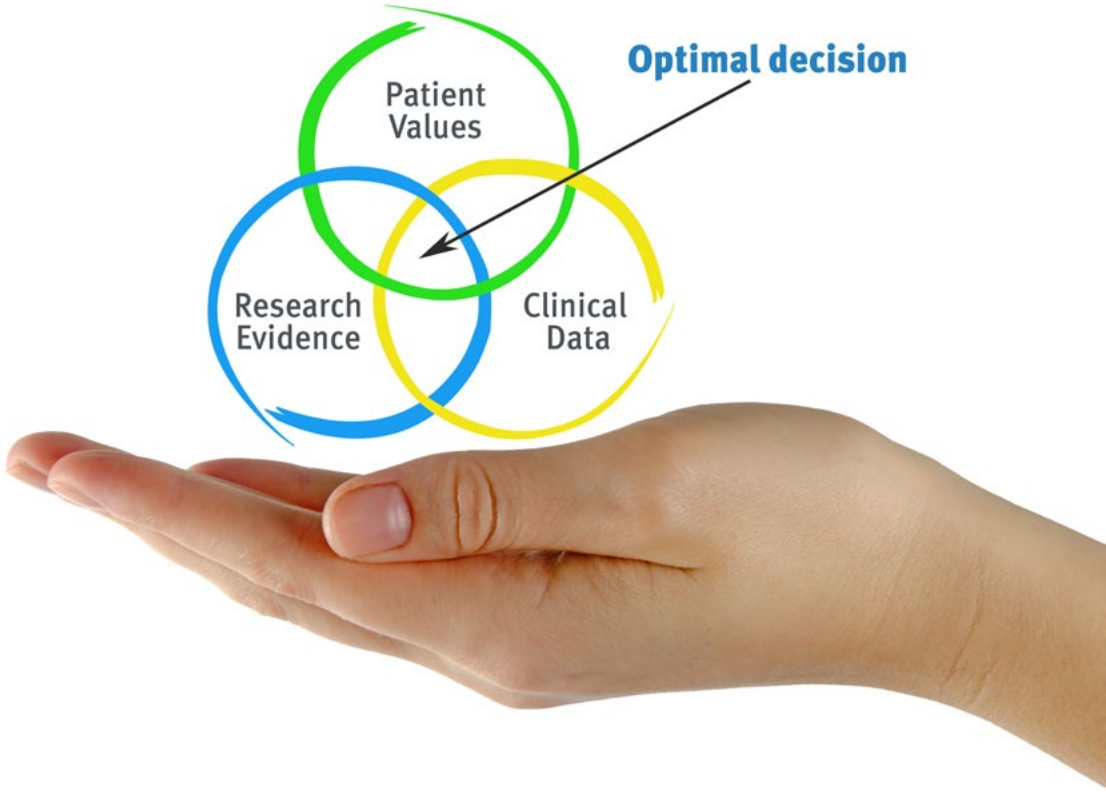
This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.

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"

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:

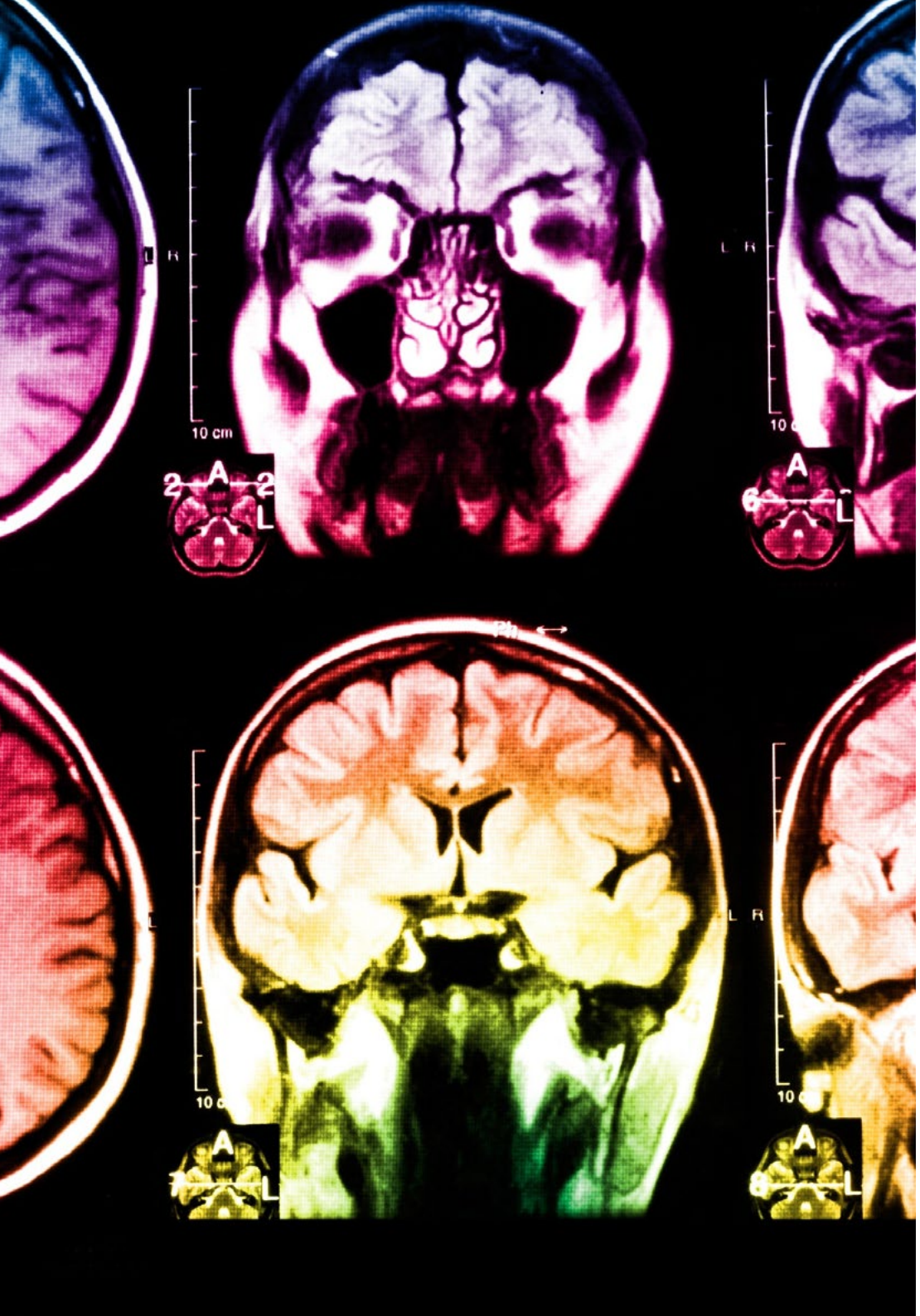
1. Nurses who follow this method not only grasp concepts, but also develop their mental capacity, by evaluating real situations and applying their knowledge.
2. The learning process has a clear focus on practical skills that allow the nursing professional to better integrate knowledge acquisition into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

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.

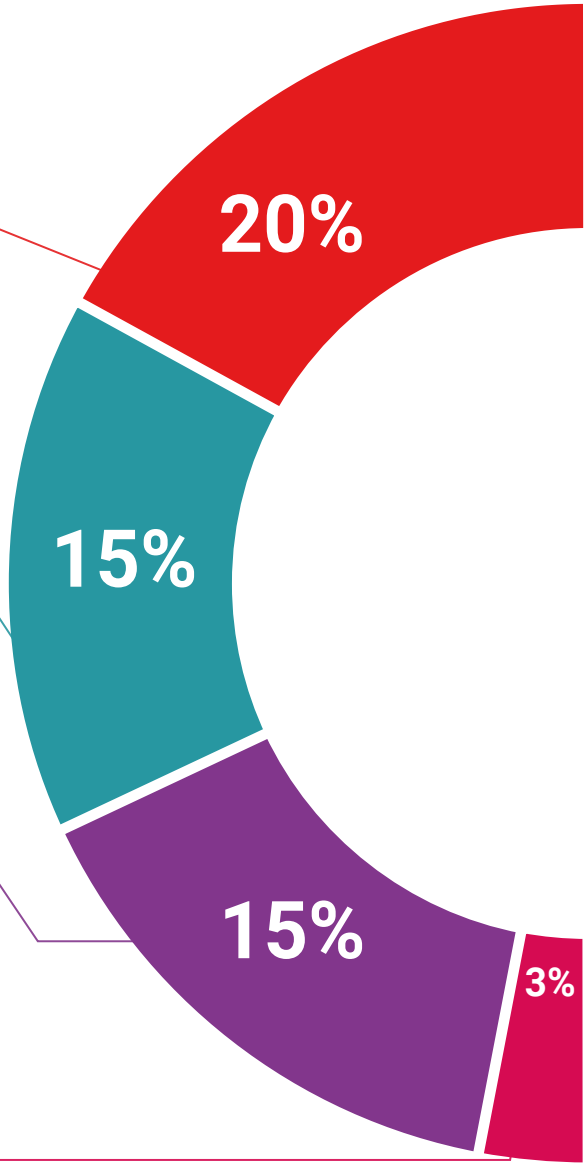
Interactive Summaries

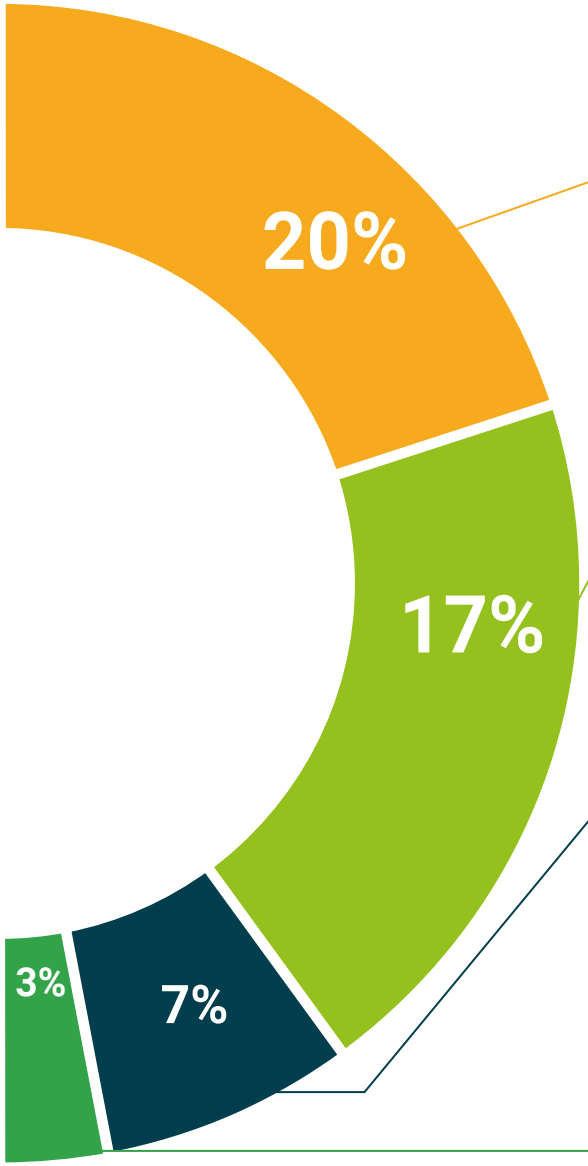
The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

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 Diploma in Radiophysics Applied to Radiotherapy guarantees, in addition to the most rigorous and training, 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 Radiotherapy** contains the most complete and up-to-date scientific 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 diploma 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 Radiotherapy**

Official Nº of Hours: **450 h.**


tech technological university

Awards the following

DIPLOMA

to

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

For having passed and accredited the following program

POSTGRADUATE DIPLOMA

in

Radiophysics Applied to Radiotherapy

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

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